

FIFTH FIVE-YEAR REVIEW REPORT
SOLID STATE CIRCUITS, INC. SUPERFUND SITE
REPUBLIC, GREENE COUNTY, MISSOURI



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

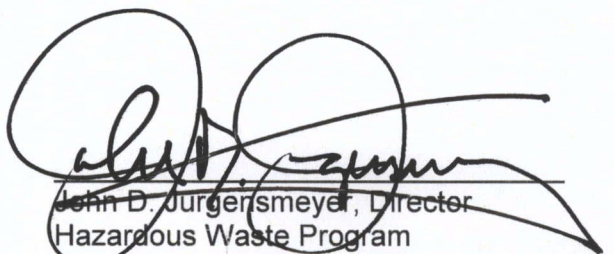


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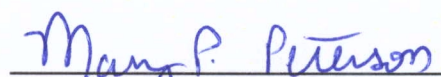
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List of Abbreviations and Acronyms

AOC	Administrative Order on Consent
Agencies	Department and EPA, collectively
AR	Administrative Record
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
bls	below land surface
bsg	below surface grade
BERA	Baseline Ecological Risk Assessment
BW	Body Weight
CalEPA	California Environmental Protection Agency
CD	Consent Decree
CD/SOW	Consent Decree/Statement of Work
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
CSR	Code of State Regulations
COCs	Contaminants of Concern
COPCs	Contaminants of Potential Concern
CW	Republic/Brookline municipal well
DBR	Deep Bedrock
Department	Missouri Department of Natural Resources
MDHSS	Missouri Department of Health and Senior Services
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
EISB	enhanced in-situ bioremediation
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Difference
1,1,1-TCA	1,1,1-trichloroethane
EWI	Environmental Works, Incorporated
ft.	feet
FSB	Fractured Shallow Bedrock
FYR	Five-Year Review
FM/ED	Force Majeure/Excusable Delay
GMMP	Groundwater Monitoring and Management Plan
gpm	gallons per minute
HEAST	Health Effects Assessment Summary Tables
HWP	Hazardous Waste Program
HHRA	Human Health Risk Assessment
ICs	Institutional Controls
IR	Inhalation Rate
IRIS	Integrated Risk Information System
ISCO	In-Situ Chemical Oxidation

List of Abbreviations and Acronyms (cont'd)

ITRC	Interstate Technology & Regulatory Council
MCLs	Maximum Contaminant Levels
µg/l	micrograms per liter
mg/kg	milligrams per kilograms
mg/m ³	milligrams per meter cubed
MO	Missouri
MRAC	Missouri Remedial Action Corporation
MSFS	Main Street Fracture System
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCEA	National Center for Environmental Assessment
NPL	National Priorities List
NSOC	National Synthetic Organic Chemical Survey
O&F	Operational and Functional
O&M	Operation and Maintenance
PCE	Tetrachloroethylene
POTW	Publicly Owned Treatment Works
ppb	parts per billion
PPRTV	Provisional Peer Reviewed Toxicity Values
PPWP	Pilot Project Work Plan
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAA	Rolling Annual Average
RAGS	Risk Assessment Guidance for Superfund
RALs	Risk Assessment Levels
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDDP	Remedial Design Document Package
RD/RA	Remedial Design/Remedial Action
Registry	Missouri <i>Registry of Confirmed Abandoned and Uncontrolled Hazardous Waste Disposal Sites</i>
RfC	Reference Concentration
RfDi	Inhalation Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
ROD	Record of Decision
RP	Responsible Party
RPM	Remedial Project Manager
SBR	Shallow Bedrock
SDWA	Safe Drinking Water Act

List of Abbreviations and Acronyms (cont'd)

SOW	Statement of Work
SPHEM	Superfund Public Health Effects Manual
SSC	Solid State Circuits
SSI	Supplemental Site Investigation
trans-1,2-DCE	trans-1,2-dichloroethene
T-2-E	Treatment System Effluent
TBC	To be considered
TCA	Trichloroethane
TCE	Trichloroethylene
TCL	Target Compound List
TPI	POTW Influent
UFSB	Unconsolidated/Fractured Shallow Bedrock
VOC(s)	Volatile Organic Compound(s)
WQS	Water Quality Standards

I. Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is, and will continue to be, protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports, such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The Missouri Department of Natural Resources'/Hazardous Waste Program (Department/HWP), the lead agency, is preparing the fifth FYR report with assistance from the U.S. Environmental Protection Agency (EPA), pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Solid State Circuits (SSC), Inc. Superfund Site. The approval of the fourth FYR, signed on September 21, 2012, was the triggering action for this statutory review. The fifth FYR is required and prepared since hazardous substances, pollutants, or contaminants remain at the SSC site above levels that allow for unlimited use and unrestricted exposure (UU/UE). The SSC site consists of one operable unit (OU) that was reviewed and will be addressed in this fifth FYR.

The SSC site's fifth FYR was conducted for the entire site by the Department's Remedial Project Manager with assistance from the EPA's Remedial Project Manager from July 1, 2016 through February 28, 2017. Other participants included Michelle Hartman, Missouri Department of Health and Senior Services (MDHSS) Human Health Risk Assessor (HHRA); Jessica Kidwell, EPA Hydrologist; Todd Phillips, EPA HHRA; and Vanessa Madden, EPA Ecological Risk Assessor. The fifth FYR began on July 1, 2016. This report documents the results of the review. The Department is submitting this fifth FYR report for the SSC site to the EPA for its concurrence pursuant to 40 CFR §300.515.

Site Location, Background and Geological/Hydrogeological Characteristics

The Solid State Circuits, Inc. (SSC) site is located in T29N, R23W Section 20 or 37° 07' 00" N, 93° 28' 48" W, on the southeast corner of the intersection of Main and Elm Streets in Republic, Missouri (Figure 1). Republic is approximately 12 miles southwest of Springfield in Greene County, Missouri, with a population of 16,005 residents (2015). The SSC site includes the northern end of the former plant building, the soils below and around the former building, and portions of the on-site and off-site underlying groundwater aquifers. The SSC site is less than one acre in size and is enclosed within a six-foot high chain link fence (Figure 4).

The original plant building and basement were constructed prior to 1902. The building's northern portion was four stories tall, the rest was one story. Numerous businesses operated on-site through the years in the building and little is known about chemicals used on-site. From 1902 to 1937, a cold refrigeration plant operated in the building's

northern portion. SSC operated in the building's northern portion from 1968 until 1973, when SSC moved. SSC manufactured printed circuit boards and used trichloroethylene (TCE). The amount of TCE used is unclear due to poor record keeping. A photographic-processing firm operated on-site from 1973 until 1979, when the northern portion burned.

The burned portion was demolished, the debris was pushed into the basement, it was filled-in to grade and the area is a vacant gravel lot. The remaining vacant building is in severe disrepair.

The SSC site lies in the downtown Republic and the surrounding land use is urban (Figure 1-2). The SSC site is surrounded by residential areas. The closest is a triplex east of the SSC site and across the 100' alleyway. Most other residential areas are 2 blocks northeast, south, east and west. Many of the dwellings are single family homes; although a six-family complex and a duplex are located on Main Street, two to four blocks south of the SSC site. Commercial properties, light industry, and warehouses are intermingled with the single family dwellings to the west. The city of Republic's properties and light industry are located north across the railroad tracks and 2 blocks south of the SSC site.

The SSC site lies on a broad upland plain with regional karst development. Dissolution of the limestone and dolomite results in the development of karst topography that includes springs, losing streams, fractures (Main Street Fracture System (MSFS)), sinkholes, and caves. Karst topography also affects the groundwater and surface water hydrology. There exists a sequence of three hydrologic groundwater aquifers that underlie the SSC site, which are the Unconsolidated/Fractured Shallow Bedrock (UFSB) aquifer, the Shallow Unfractured Bedrock (SBR) aquifer, and the Deep Bedrock (DBR) aquifer. Shuyler Creek, a losing stream, is lost to the shallow bedrock aquifer and is thought to feed Roberts Spring (Figure 1-2). The city of Republic is located on a northeast-southwest trending topographic high that serves as a drainage divide between the Sac River (north) and the Shuyler Creek/Wilson Creek/James River (south). Elevation at the SSC site is approximately 1,300 feet above mean sea level.

Fifth Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Solid State Circuits, Inc.		
EPA ID: MOD980854111		
Region: 7	State: MO	City/County: Republic, Greene County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: State <i>[If "Other Federal Agency", enter Agency name]:</i> Missouri Department of Natural Resources/Hazardous Waste Program		
Author name (Federal or State Project Manager): Candice McGhee		
Author affiliation: State of Missouri		
Review period: 7/1/2016 - 2/28/2017		
Date of site inspection: 10/20/2016		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/21/2012		
Due date (five years after triggering action date): 9/21/2017		

II. Response Action Summary

Basis for Taking Action

Sample data collected during the pre-remedial and remedial investigations and removal actions up to and including the Remedial Investigation/Feasibility Study (RI/FS) identified over 34 contaminants of potential concern (COPCs) on-site and/or off-site, including volatile organic compounds (VOCs) and metals. VOC contamination, predominantly TCE, was detected in various media, including on-site and off-site soils, on-site and off-site groundwater in the three hydrogeologic aquifers, utility corridors and manholes, and the influent wastewater to the Publicly Owned Treatment Works (POTW). A summary of the detected COPCs including VOCs and metals are found in Table 1.

Table 1 - Detected COPCs

VOCs	VOCs (cont'd)	VOCs (cont'd)	METALs
Acetone	2-Chloroethyl Vinyl Ether	2-Hexanone	Chromium
Benzene	Chloroform	Methylene Chloride	Copper
Bromodichloromethane	Chloromethane	4-Methyl-2-Pentanone	Lead
Bromoform	1,1-Dichloroethane	Tetrachloroethene (PCE)	Mercury
Bromomethane	1,1-Dichloroethene	Toluene	Nickel
2-Butanone (MEK)	1,2-Dichloroethane	1,1,1-Trichloroethane	Zinc
Carbon Disulfide	1,2-Dichloroethene (total)	1,1,2-Trichloroethane	
Carbon Tetrachloride	1,2-Dichloropropane	Trichloroethene	
Chlorobenzene	cis-1,3-Dichloropropene	Vinyl Acetate	
Chlorodibromomethane	trans-1,3-Dichloropropene	Vinyl Chloride	
Chloroethane	Ethylbenzene	Xylenes (total)	

Due to the large number of COPCs and the wide variations in occurrence, concentrations, and toxicities found among the COPCs, a selection process was implemented to identify contaminants of concern (COCs) for evaluation in the HHRA and Screening Level Ecological Risk Assessment (SLERA) (Table 2). The detection of contaminant concentrations above health-based standards was the basis for choosing the site's COCs. Metals were not considered since their contaminant concentrations were detected below health-based standards.

Table 2 – COCs in Groundwater and Compliance Levels

COCs	Compliance Levels
1,1-dichloroethane (1,1-DCA)	None
1,1-dichloroethene (1,1-DCE)	7 µg/l
cis-1,2-dichloroethene (cis-1,2-DCE)	70 µg/l
trans-1,2-dichloroethene (trans-1,2-DCE)	100 µg/l
1,1,1-trichloroethane (1,1,1-TCA)	200 µg/l
trichloroethene (TCE)	5 µg/l
vinyl chloride	2 µg/l

The chosen site COCs were used in the HHRA and the SLERA. The carcinogens used in the Risk Assessments were 1,1-DCA, TCE, and vinyl chloride, while the noncarcinogens used were 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE and 1,1,1-TCA. At the time of the Risk Assessments, federal and state standards and criteria existed to protect drinking water and fresh-water aquatic life. The federal standards (Maximum Contaminant Levels [MCLs]) and/or Missouri Water Quality Standards (MWQS) existed for the 1,1-DCE, 1,1,1-TCA, TCE, and vinyl chloride. Maximum Contaminant Level Goals (MCLGs) existed for trans-1,2-DCE. No regulatory standards existed for 1,1-DCA or cis-1,2-DCE.

Based on the HHRA, no unacceptable health risks were identified for current receptors on and around the SSC site; however, there was the potential for future unacceptable risks.

Future risks could be the result of dermal contact with the SSC site or ingestion of contaminated groundwater beneath or in close proximity to the SSC site.

To prevent future risk the following assumptions were made: that the contaminated groundwater at or near the SSC site will not be used for human consumption; that private and public wells will not be drilled through or near the contaminant plumes (City Ordinance, Figure 1-4); and the remediation of the contaminated groundwater would continue as required.

Based on the results of the SLERA, no adverse effects were identified for terrestrial or aquatic ecosystems. There was no indication of threatened or endangered wildlife species; however, it was determined that should the groundwater/surface water comprising Roberts Spring become contaminated by site-related VOC contamination in the future that it could potentially pose a new ecological risk.

Removal History

TCE was detected in Republic's municipal well (CW-1) during the National Synthetic Organic Chemical Survey in June 1982 (Table 3 in Appendix B). The Department and Missouri Remedial Action Corporation (MRAC), the responsible party (RP), conducted response actions at the SSC site in 1984. Extensive soil and groundwater sampling was done to delineate the on-site and off-site contamination. Soil and groundwater sampling delineated the on-site contaminated soils and debris that exceeded risk-based action levels for commercial/industrial use and determined the location of the basement well. Using the risk-based action levels for commercial/industrial use, the on-site contaminated soils and debris were excavated around the former plant building basement and were stored on-site until a proper disposal facility was located.

After signing an Action Memorandum, the EPA undertook an immediate removal action in 1985. EPA conducted additional soil and groundwater sampling to determine the extent of the on-site contamination. Since additional sub-basement soils and debris were found contaminated, these contaminated materials were excavated to bedrock and shipped off-site along with the previously stockpiled contaminated materials for disposal. Using the risk-based action levels for commercial / industrial use, the potential existed for a portion of the basement foundation and elevator shaft, along with associated soils was left in place. The basement well was abandoned per Missouri state regulations and the excavation was filled to grade. All on-site work was completed in October 1985.

Remedial History

A Remedial Investigation/Feasibility Study (RI/FS) was conducted from December 1985 to July 1989, during which multi-media monitoring and sampling events were conducted. Sampling included on-site and off-site air, surface and sub-surface soils, utility corridors, surface water and groundwater. Additional work included the installation of monitoring wells and the construction of a new Republic municipal well CW-4. The two air strippers were constructed and a pilot study was implemented to evaluate the extraction and treatment of the TCE and other VOC contaminated groundwater.

Remedy Selection

The Record of Decision (ROD) for the SSC site was signed on September 27, 1989. Based on the data collected up to and during the RI and the evaluation of health risks, remedial action objectives (RAOs) were developed for the SSC site to aid in the development and screening of the remedial action alternatives. Based on the 1984 and 1985 soil and groundwater sampling and the on-site soil and debris removal actions completed, it was assumed that the previous response actions had completely addressed (discovered, excavated and disposed off-site) the full extent of the on-site contaminated soil and debris by October 1985, so the following RAOs were identified during the remedy selection process only for the contamination in the three groundwater aquifers. The RAOs include:

- Prevent potential exposure to contamination in groundwater;
- Protect uncontaminated groundwater for future use by preventing further migration of the contaminated plumes in the groundwater; and
- Restore contaminated groundwater for future use by reducing the contaminant concentrations to regulated or health-based levels.

The major components of the selected remedy in the ROD were:

1. Extraction of contaminated groundwater from the three aquifers;
2. On-site physical/chemical treatment using air stripping to promote volatilization of the contaminants from the extracted groundwater;
3. Discharge of treated effluent to the Republic Publically Owned Treatment Works (POTW) to undergo additional off-site treatment;
4. Enactment of an ordinance by the city of Republic to prevent construction of drinking water wells in or near the contaminated plumes to prevent direct contact/ingestion of contaminated groundwater before remediation is complete; and
5. Continued monitoring to determine the effectiveness of the remedy.

Status of Implementation

The EPA issued a Remedial Design/Remedial Action (RD/RA) Special Notice Letter on December 13, 1989. Following extensive negotiations between the RP (MRAC) and the Agencies, the Consent Decree/Statement of Work (CD/SOW) was signed by the MRAC and the Agencies in July 1990. The CD/SOW was lodged with the court on January 6, 1991 and then entered by the court on May 31, 1991; thus initiating the start of RD.

Monitoring Plan Development

The chemical monitoring of the wells and surface water locations initially included all VOCs from the Target Compound List (TCL) (Table 4). A pilot study was conducted to establish the groundwater / surface water monitoring and sampling schedule, and whether TCE was comparable to the TCL VOCs when collected and analyzed. The removal efficiencies of TCE and the TCL VOCs were compared and it was determined that the TCE removal efficiency was comparable with the TCL VOCs. This was the basis

for establishing the frequency of chemical and hydraulic sampling/monitoring and reporting of TCE or TCL VOCs for the site's RA and future Operation and Maintenance (O&M) actions.

Table 4 - Target Compound List (TCL) from 1990 CD/SOW

VOCs and Metals		
Acetone	1,1-Dichloroethane	Toluene
Benzene	1,1-Dichloroethene	1,1,1-Trichloroethane
Bromodichloromethane	1,2-Dichloroethane	1,1,2-Trichloroethane
Bromoform	1,2-Dichloroethene (total)	Trichloroethene (TCE)
Bromomethane	1,2-Dichloropropane	Vinyl Acetate
2-Butanone (MEK)	cis-1,3- Dichloropropane	Vinyl Chloride
Carbon Disulfide	trans-1,3- Dichloropropane	Xylenes (total)
Carbon Tetrachloride	Ethylbenzene	Chromium
Chlorobenzene	2-Hexanone	Copper
Chlorodibromomethane	Methylene Chloride	Lead
Chloroethane	4-Methyl-2-Pentanone	Mercury
2-Chloroethyl Vinyl Ether	Styrene	Nickel
Chloroform	1,1,2,2-Tetrachloroethane	Zinc
Chloromethane	Tetrachloroethene (PCE)	

Groundwater Extraction and Treatment

As part of the RD/RA process, a second pilot study was initiated to test various extraction well pumping schemes in order to better define the pumping and discharge rates. The results of the second pilot study were incorporated into the 100% Remedial Design Document Package (RDDP) that was submitted to the Agencies in October 1992. The Agencies determined that the proposed system for removing TCE from the extracted contaminated groundwater was 98% to 99% efficient. On December 22, 1992, the Department approved, and the EPA concurred with, the 100% RDDP for the groundwater cleanup alternative.

The RA construction began on January 11, 1993, and included the installation, testing, and sampling of wells and the groundwater pump and treatment (P&T) system. The RA consisted of groundwater extracted from the on-site and off-site UFSB extraction wells, the on-site SBR extraction wells, and the on-site and off-site DBR extraction wells to remove the VOC contamination from the three hydrogeologic aquifers; to control the movement of the VOC contamination in groundwater away from the SSC site and to prevent the movement of the VOC contamination in groundwater into the Republic municipal wells. The SSC site's monitoring network consisted of on-site and off-site UFSB wells, off-site SBR wells, on-site and off-site DBR wells, Republic's active municipal wells, Roberts Spring, Cave Well, Republic's POTW, and two Sewer Discharge locations, and the on-site. Republic's municipal well CW-2 was taken off-line during this time for reasons unrelated to the SSC site, and Republic's new municipal well CW-5 was constructed and brought on-line. The RA construction actions were completed on September 20, 1993 (Figures 1 and 1-2).

On October 29, 1993, the Department sent the EPA the Preliminary Closeout Report for the SSC site. The EPA signed the document on December 1, 1993. In March 1994, the Department conducted a pre-certification inspection of the RA at the SSC site. The inspection determined that the RA construction was complete and that the remedy was operational and functional (O&F). The EPA concurred with the O&F determination on May 19, 1994.

On May 31, 1994, the Department received the RA Certification Report and As-Built Drawings for the SSC site. The Agencies sent MRAC the "Certification of Completion of the Remedial Action" for the SSC site in September 1994. The document notified the MRAC that the remedy for the SSC site was O&F, and it initiated the SSC site's long-term O&M.

Institutional Controls

As part of the Fifth FYR, institutional controls (ICs) related to the SSC site were reviewed and evaluated by the Agencies and MRAC. Besides the SSC site being on the federal NPL (06/10/1986) and the Missouri's 10 CSR 25-10.010 *Registry* Missouri (02/22/1985), there exists a Republic Ordinance No. 05-68 §1 that was established with the SSC site ROD (last revised 08-22-05) (local IC) (Figure 1-4) and a Missouri 10 CSR 23-3.100(3) "Sensitive Area C" designation (1993) (state IC) (Table 5).

Table 5 - Summary of Implemented ICs at SSC site

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes	Yes	Entire SSC site	Informs public & buyers of location & status of contaminated properties	Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites in MO
Groundwater	Yes	Yes	Entire SSC site	Sets casing requirements of wells drilled specific (special) areas of MO	MO Wellhead Protection Area 1-Greene County, MO "Sensitive Area C" designation
Groundwater	Yes	Yes	Entire SSC site	Restricts installation of groundwater wells & groundwater use	Republic's well construction ordinance Ord. No. 05-68 §1

Even though the Agencies determined the current three ICs were adequate for the SSC site at this time, the Department with the EPA's concurrence is recommending that an environmental covenant (EC), under the Missouri Environmental Covenants Act (MoECA), be placed on the SSC property. The MoECA will be recorded with the property's chain-of-title and notify prospective buyers of land use limitations and the property's environmental condition.

System Operations, Operation and Maintenance, and Force Majeure/Excusable Delay

After construction was completed at the site, the long-term O&M for the SSC site was required to evaluate the monitoring actions and site management as part of the groundwater RA. On September 23, 1994, the Department received the final copy of the "Addendum Report to the RA Groundwater Monitoring and Management Plan (GMMP)." The GMMP contains the specific tasks required to monitor and maintain the remedy including hydraulic control measures for the three hydrogeologic aquifers (UFSB, SBR, and DBR), management of the extraction and monitoring wells (Figure 1), data collection and analysis, management practices, data reporting, and Quality Assurance/Quality Control (QA/QC) requirements. O&M activities also include a periodic review of Republic's well construction ordinance. The last revision of Republic's well construction ordinance, Ord. No. 05-68 §1, was August 22, 2005. The Agencies had an opportunity to review and comment on the ordinance before it was finalized.

In addition to the operating RA system, MRAC submitted a proposal to use a horizontal well as an innovative technology to assist in the remediation of the TCE contamination found in the UFSB on July 15, 1997. The horizontal well was installed north to south along Main Street in 2001, tested, and deemed operational. An Explanation of Significant Differences was signed in September, 2004, formally adding the horizontal well to the selected remedy. The horizontal well was in continuous operation until a fire occurred on-site in December 2011.

Vapor Intrusion became an emerging issue in 2002, with the release of an EPA Draft Guidance. In 2007, the RP conducted a Gore-Sorber soil gas survey that discovered elevated soil gas concentrations of TCE and 1,1,1-TCA on-site and off-site. A Supplemental Site Investigation (SSI) was conducted in 2010, that discovered three areas of soil contamination: one on-site (Area 1) and two off-site (Areas 2 and 3) that correlated with the three elevated soil gas locations. Since it was believed the three soil source areas were contributing VOC contamination into groundwater, the Fourth FYR (2012) recommended the three soil source areas be address with interim measures as pilot studies.

The on-site December 8, 2011, fire destroyed the P&T system's operations building, resulting in the cessation of groundwater extraction and treatment at the SSC site. The exception is the SSC-31 well where extraction continues and the extracted water is directly discharged to the city of Republic sanitary sewer. The Agencies were verbally notified of the building's destruction on December 8, 2011, and a written notification of Force Majeure/Excusable Delay (FM/ED) situation was submitted on December 16, 2011,

in accordance with the Consent Decree. The FM/ED notification was approved by the Agencies on December 29, 2011.

To guide in future site activities, a FM/ED Agreement (Appendix C) was developed and signed on June 15, 2012 and was amended on December 8, 2014. The FM/ED Agreement outlines future remedial actions, plus a Focused Feasibility Study (FFS). Since remedial actions are still ongoing and could include additional soil remediation under the pilot programs and continued groundwater/surface water and soil sampling/monitoring, the implementation of the FFS is delayed until their completion. The FFS will be completed within 270 days after the completion of the future remedial actions. The FFS, once completed, will contain an updated site conceptual model, updated HHRA and SLERA, and an evaluation of future remedial action alternatives for the SSC site.

The Agencies requested that the MRAC continue to conduct groundwater monitoring/sampling under the FM/ED Agreement. The groundwater monitoring/sampling has allowed for the evaluation of the effects of the cessation of pumping across the SSC site and the effects of Area 1 and Areas 2/3 pilot program remediation efforts. These site-related actions and the results are chronicled in Force Majeure Supplemental Sampling Events (FMSSEs) Reports. There were 18 FMSSEs between February 2012 and September 2016.

III. Progress Since the Last Review

This section includes the protectiveness determinations and statements from the last five-year review as well as the recommendations from the last five-year review and the current status of those recommendations.

Table 6 - Protectiveness Determinations/Statements from the 2012 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protectiveness Deferred	A protectiveness determination of the remedy cannot be made at this time until further information is obtained, due primarily to the destruction of the groundwater pump and treat system by fire in December 2011. Further data and information will be obtained by taking the following actions: completing a comprehensive vapor intrusion study of all structures overlying potentially impacted groundwater, addressing all soil source areas, delineating the contaminant plumes in all three water bearing zones and fully containing the contaminant plumes in groundwater. It is expected that these actions will take approximately 3.5 years to complete, at which time a protectiveness determination will be made.
Sitewide	Protectiveness Deferred	A protectiveness determination of the remedy cannot be made at this time until further information is obtained, due primarily to the destruction of the groundwater pump and treat system by fire in December 2011. Further data and information will be obtained by taking the following actions: completing a comprehensive vapor intrusion study of all structures overlying potentially impacted groundwater, addressing all soil source areas, delineating the contaminant plumes in all three water bearing zones and fully containing the contaminant plumes in groundwater. It is expected that these actions will take approximately 3.5 years to complete, at which time a protectiveness determination will be made.

Table 7 - Status of Issues and Recommendations from the 2012 FYR

Issues	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	Re-evaluate progress towards achieving RAOs	Re-evaluate progress towards achieving RAOs after cleanup/removal of soil source areas.	Addressed in Next FYR	Discussed below.	
2	Delineate horizontal and vertical limits of UFSB and SBR plumes	Install additional monitoring wells in the UFSB and SBR to confirm horizontal and vertical plume boundaries.	Addressed in Next FYR	Discussed below.	
3	Define vapor intrusion (VI) plume	Conduct quantitative vapor intrusion (VI) study to confirm and remediate the VI pathway.	Addressed in Next FYR	Discussed below.	
4	Remediate/remove soil source areas.	Treat/remove the three VOC contaminated soil source areas.	Addressed in Next FYR	Discussed below.	
5	Complete Abandonment and Closure of Republic's CW-1 well	Complete the abandonment and closure of the CW-1 well to remove the vertical VOC pathway to DBR.	Completed	CW-1 abandonment and closure activities were initiated in October 2011 and complete in May 2012.	5/21/2012
6	Implement additional institutional controls (ICs)	Implement additional ICs by recording an environmental covenant with the SSC property's chain of title	Addressed in Next FYR	MRAC will work with the property owner and the Agencies to complete and record an environmental covenant on the property.	
7	Assure compliance with and implementation of work required by the Force Majeure / Excusable Delay (FM/ED) Agreement	Investigate and remediate/remove the soil source areas and continue to extract and monitor the three VOC contaminant plumes in groundwater. Complete a focused feasibility study.	Addressed in Next FYR	Discussed below.	
8	Sample for 1,4-dioxane	Add sampling for 1,4-dioxane to future groundwater sampling events to determine if 1,4-dioxane contamination is present at the SSC site.	Completed	Conducted four quarters of sampling to determine presence and extent of 1,4-dioxane in SSC site wells.	3/31/2014

Issue #1: Area 1 soil blending was conducted in December 2012. Additional groundwater and soil sampling will be conducted in Area 1 to assess the treatment effectiveness and to support an updated risk assessment. Areas 2 & 3 are still undergoing active remediation. Groundwater and soil sampling in these areas will be used as part of the FFS. Additional detail on these activities is discussed below.

Issue #2: In March 2015, three wells (on-site SSC-29 (UFSB), on-site SSC-6C (SBR) and off-site SSC-3A (SBR)) were reconfigured to sample specific intervals within the UFSB and through the SBR (Figure 2-5). Based on the limited data collected from these three wells, VOC contamination was detected vertically on-site from 32 to 54 feet below monitoring point (bmp) and off-site around 42 feet bmp. Based on data gaps south of the SSC site, additional groundwater investigations were conducted to define the southern horizontal and vertical extent of the UFSB. Data collected to date still do not clearly delineate the vertical and horizontal extent of groundwater contamination in the SBR and DBR and additional data collection is needed.

Issue # 3: A limited qualitative soil gas survey conducted in June-July 2007 revealed vapor-phase VOCs primarily on-site. To fully evaluate VI on-site and off-site, a VI assessment will begin in late 2017 to mid-2018.

Issue #4: The three soil source areas identified during the Supplemental Site Investigation (SSI) were treated in December 2012 (Area 1) and October 2015 (Areas 2 & 3). Remediation is ongoing in Areas 2 & 3 and is expected to continue throughout 2017. Verification soil and groundwater sampling will be conducted in early 2018. Additional detail on these activities is discussed below.

Issue #7: Remediation of the three soil source areas (Areas 1, 2 & 3) was conducted and treatment is currently ongoing in Areas 1, 2 & 3. Due to the 2011 on-site fire and with Agency approval, MRAC is using the SSC-31 well as the southern boundary extraction well for the UFSB plume. Groundwater monitoring of the three contaminant plumes continues and is reported on a regular, on-going basis. The focused feasibility study (FFS) will be conducted once the treatment of the Areas 1, 2 & 3 is complete and the collection of additional data to address existing data gaps has been completed in December 2018.

Issue #8: The issue of 1,4-dioxane became an emerging contaminant at groundwater sites with VOC contamination in 2009. To address this issue, all on-site and off-site wells were sampled for 1,4-dioxane for four quarters (June 2013, September 2013, December 2013 and March 2014). Four on-site (REM-2 (SBR), SSC-6C (SBR), SSC-11 (UFSB) and SSC-29 (UFSB)) wells and one off-site (SSC-65 (UFSB)) well had at least one detection of 1,4-dioxane above the USEPA Screening Level (6.1 µg/l). Since March 2014, two annual (March 2015 and March 2016) 1,4-dioxane sampling events were conducted and the results were comparable to the previous quarterly sampling events. Sample results indicate the 1,4-dioxane is located on-site (Area 1) in the UFSB and SBR, except for one UFSB (SSC-65) well (Area 2) located about 2 blocks south of the SSC site (Table 4-16). Since a number of the issues/recommendations have not been completed, a FYR addendum was not completed and these pending issues will be included in this FYR.

As stated in the Operation and Maintenance Section, after the 2011, fire, under a FM/ED Agreement and summarized above in the issues/recommendations from the 2012 FYR, a number of pilot activities are underway to evaluate the efficacy of groundwater restoration and need for additional soil response activities. Work completed in these areas is discussed in more detail below.

Area 1 Pilot Program

The Area 1 Pilot Program consisted of various activities carried out in four phases as follows:

- Phase 1 consisted of delineating the impacted Area 1 soils (Figure 3), installation of four additional monitoring wells, and conducting a bench scale treatability study on the Area 1 soil and groundwater to determine treatment.
- Phase 2 consisted of a baseline groundwater sampling/monitoring event before implementing the chosen remedial action, and the implementation of the remedial action of the Area 1 soils. Soil mixing/blending of the chemical oxidant (potassium permanganate) within the contaminated soil layer, 15' to 24' below land surface (bls), was completed in mid-December (December 10-19) 2012. The site's restoration actions were completed in the spring of 2013.
- Phase 3 consisted of six post-treatment groundwater sampling/monitoring events (PTME) that occurred between December 2012 and September 2013. The first three events, PTME-1 through PTME-3, occurred in December 27-28, 2012, January 28-February 5, 2013, and February 25-March 8, 2013, on a monthly basis. The remaining PTMEs were incorporated in the FMSSE events on a quarterly basis until September 2013.
- Phase 4 was the summation report that contained the compilation of the first three PTMEs after the soil mixing and blending event in December 2012.

Areas 2 and 3 Supplemental Characterization and Treatability Investigation (SCTI)

Borehole geophysics was conducted on five large diameter wells (SSC-3A, SSC-6C, SSC-29, SSC-30 and SSC-31) and three small diameter wells (SSC-23, SSC-24 and SSC-25). SSC-3A and SSC-6C extend into the SBR, SSC-24 is near the FSB fracture, and SSC-23 and SSC-25 are outside the FSB fracture. The resulting geophysical data indicated that: 1) the FSB is a VOC preferential pathway due to fracturing and secondary porosity; 2) the FSB is highly-fractured to about 75 feet; and 3) the primary groundwater flow path appears to be located near the soil/bedrock interface.

Based on the geophysics analysis, three wells (SSC-3A, SSC-6C and SSC-29) were reconfigured for discrete groundwater sampling of vertical horizons at specific depth intervals to better define the locations of site-related VOCs in groundwater. The three wells were reconfigured using the Waterloo system, with seven sampling/monitoring intervals, labeled as R+number, in SSC-3A and SSC-6C and five sampling/monitoring intervals in SSC-29 (Figure 2-5, Table 8). For SSC-3A, intervals SSC-3A-R1 and SSC-3A-R2 monitor the UFSB, while intervals SSC-3A-R3 through SSC-3A-R7 monitor the

SBR. For SSC-6C, interval SSC-6C-R1 monitors the UFSB, while intervals SSC-6C-R2 through SSC-6C-R7 monitor the SBR. For SSC-29, intervals SSC-29-R1 through SSC-29-R5 only monitor the UFSB. The groundwater sample results for these three modified wells can be found in Section D-Groundwater and Surface Water Sample Results.

Table 8 – Information Regarding the Three Reconfigured Wells

Well #	Sampling Interval	Groundwater Zone	Well #	Sampling Interval	Groundwater Zone
SSC-3A	SSC-3A-R1(40')	UFSB	SSC-3A	SSC-3A-R3(94')	SBR
	SSC-3A-R2(60.5')	UFSB		SSC-3A-R4(151.5')	SBR
				SSC-3A-R5(199')	SBR
				SSC-3A-R6(255.5')	SBR
				SSC-3A-R7(279')	SBR
SSC-6C	SSC-6C-R1(42')	UFSB	SSC-6C	SSC-6C-R2(77.5')	SBR
				SSC-6C-R3(90')	SBR
				SSC-6C-R4(118.5')	SBR
				SSC-6C-R5(195')	SBR
				SSC-6C-R6(226.5')	SBR
				SSC-6C-R7(283')	SBR
SSC-29	SSC-29-R1(32')	UFSB			
	SSC-29-R2(43.5')	UFSB			
	SSC-29-R3(54')	UFSB			
	SSC-29-R4(71.5')	UFSB			
	SSC-29-R5(85')	UFSB			

Areas 2 and 3 Pilot Program

The Areas 2 and 3 Pilot Project Work Plan (PPWP) provides direction for the implementation and evaluation of treatment activities in Areas 2 and 3 (Figures 3 and 5). The selected treatment method, biologically mediated in situ bioremediation (ISB), uses a combination of four products including 3-D Microemulsion (3DME) and Bio-Dechlor INOCULUM Plus (BDI+) culture for use in clay soils, and PlumeStop and Hydrogen Release Compound (HRC) for use in weathered rock. The overall goals for Areas 2 and 3 are to reduce the VOC concentrations, to protect the bedrock aquifer from potential VOC migration, and mitigate the effect of the VOC impacted soil on the dissolved-phase plume (MRAC, 2015).

The Areas 2 and 3 PPWP scope was designed in the following four phases to direct treatment activities:

- Phase 1 included additional testing to evaluate method of delivery and spacing of injections. The results confirmed that the clay matrix at the SSC site was amenable to accepting the volume of solution proposed and that a radius of injection (ROI) greater

than 5 feet was achievable. Based on the results, the injection point spacing was increased from 10 feet to 12 feet to attain a 6-foot radius of injection, and the volume of solution applied per injection point was subsequently increased to maintain the overall product loading as calculated on an aquifer-volume basis.

- Phase 2 included (a) baseline groundwater sampling, (b) preparation for injection activities, (c) implementation of injection activities, and (d) post-injection activities. During the implementation of injection activities, the IBS solutions were injected at 193 locations between October 6 and 19, 2015. The IBS was injected into the impacted zone from about 10 feet bls to 3 feet above bedrock, meeting the design and project objectives outlined in the Areas 2 and 3 PPWP Addendum (MRAC, 2015).
- Phase 3 included two post-treatment monitoring events for VOCs, geochemical parameters, water quality parameters, and the IBS microbial populations. The data collected during these two events revealed that the Phase 2 injection activities produced aquifer conditions that are conducive to microbial-mediated reductive dechlorination within the Areas 2 and 3 treatment areas.
- Phase 4 included a compilation of the two post-treatment groundwater monitoring/sampling events, which were included in a combined Area 1 and Areas 2 and 3 Report (February 2017). The report includes a discussion of the completed Area 2 and 3 activities and the September 2016 groundwater sample results.

IV. Five-Year Review Process

Community Notification, Involvement and Site Interviews

A public notice (Appendix F) was made available through two local newspapers, the Greene County Commonwealth and the Lawrence County Record, as a display advertisement on July 27, 2016. The advertisement stated that the fifth Five-Year Review for the Solid State Circuits, Inc. Superfund Site had begun and invited the public to submit any comments to the U.S. EPA.

The results of the review and the report will be made available to the public (Appendix G).

During the FYR process, a limited number of interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The results of these interviews are summarized below.

The major concern related to the site, has been the amount of time needed to implement, and complete the original remedy. Since the 2011, fire, which totally destroyed the on-site pump and treat operation, the perceived on-site and off-site progress appears to be moving faster due to the amount of current on-site and off-site field work completed during this FYR time. The public is looking forward to the closure of the SSC site.

Site Inspection

The FYR inspection for the SSC site was conducted on October 20, 2016 (Appendix D). In attendance were Candice McGhee, MDNR/HWP, Lead Agency; Laura Price and Jessica Kidwell, EPA, Support Agency; Steve Oberkrom, Nokia EH&S, MRAC; Anthony Moore, EWI, consultant for MRAC; and David Brock, Republic's Public Works Director.

The purpose of the inspection was to assess the protectiveness of the remedy by assessing the partially and fully completed field work done during this FYR, which mostly is occurring below the ground surface. Field actions completed were soil mixing/blending and post-mixing groundwater monitoring in Area 1; implementation of injection activities and post-injection groundwater monitoring in the Area 2 and 3; and vapor intrusion monitoring near Highway 60. Since most of the site-related impacts were below the ground surface, these actions were not always visible (Appendix E).

Data Review

Groundwater, soil and soil gas data were obtained during this FYR review period consistent with the Force Majeure/Excusable Delay Agreement. Data collection and analysis is being conducted to re-evaluate the groundwater remedy and its ability to achieve groundwater RAOs, support soil pilot testing in Areas 1, 2, and 3, and assess the potential for vapor intrusion at the SSC site. Each of these activities is discussed in detail below.

A. Pump and Treat System

After the 2011 fire, the groundwater pump and treat system was destroyed. However, extraction well SSC-31's infrastructure was designed for direct discharge to Republic's sewer system along Main Street and did not require the pump and treat system for operation. Due to its location along the fracture system, its distance off-site, and its continued critical purpose as the UFSB sentential extraction well for the SSC site, SSC-31 continues to operate as a vital component of the SSC site's extraction / monitoring system (Section D. Groundwater and Surface Water Sample Results).

During this FYR period, the POTW's TPI and TPE sample results were similar to historical sample results. Low levels of non-site-related VOC concentrations were detected in the TPI results; however, no VOC concentrations were detected in the TPE results.

B. 1,4 Dioxane Sampling and Sample Results

Beginning in early 2009, the issue of 1,4-dioxane became an emerging contaminant at groundwater sites with VOC contamination. A recommendation to conduct 1,4-dioxane sampling was included in the issues/recommendations section of the Fourth FYR completed in 2012. As part of the ongoing groundwater monitoring, multiple sampling events at key extraction and monitoring wells were conducted to determine the presence or absence of 1,4-dioxane. The RP conducted four consecutive quarterly 1,4-dioxane sampling events in second quarter (June) 2013 through first quarter (March) 2014 (Tables

9-10). There were 29 sampling locations that were former and current extraction and monitoring wells from the three hydrogeological zones and a surface water location.

Based on the four consecutive quarterly 1,4-dioxane sampling events (06/13, 09/13, 12/13 and 03/14) and the two annual events (03/15 and 03/16) (Table 4-16), the following information and data was obtained.

- 1) Seven of the eight wells with 1,4-dioxane concentrations above the RSL of 6.1 µg/l were located within the fenced-in area (Area 1). SSC-65 was the exception, which is located 1.5 blocks due south of the SSC site in the southern portion of Area 2.
- 2) Detections of 1,4-dioxane in SSC-29 and SSC-6C within the Multilevel Waterloo intervals were less than when the wells were open boreholes.

Table 9 – Wells with 1,4-Dioxane Detections

Well #	Lowest 1,4-Dioxane Concentration Detected	Highest 1,4-Dioxane Concentration Detected	# of Detections/# of Sampling Events
SSC-6C-R1 (42')	N/A	3.4	1/2
SSC-11	55.9	91.3	6/6
SSC-29	7.2	7.9	3/4
SSC-29-R5 (85')	4.9	5.5	2/2
SSC-65	4.1	24.6	4/6
REM-2	21.5	25.5	5/6
SSC-6C	7.3	7.8	3/4
SSC-6C-R7 (238')	N/A	4.1	1/1

Notes:

All values reported in micrograms/liter (µg/l).

N/A – Not applicable, no value

ft bmp – feet below measuring point

Detections above the USEPA Screening Level (RSL) of 6.1 µg/l in **bold** type.

Multilevel Waterloo Systems installed in SSC-3A, SSC-6C and SSC-29 in March 2015.

If no VOCs detected in SBR multilevel intervals, then 1,4-dioxane was not analyzed in those intervals.

No shading – UFSB wells

Light Blue – SBR wells

Light Orange – DBR wells

Table 10 – Wells and Spring with No Detections of 1,4-Dioxane

Well #	# of Non-Detects/# of Sampling Events	Well #	# of Non-Detects/# of Sampling Events
SSC-3A-RI (40')	2/2	SSC-29-R1 (32')	2/2
SSC-9	2/2	SSC-29-R2 (43.5')	1/1
SSC-12	4/4	SSC-29-R3 (54')	1/1
SSC-13	4/4	SSC-29-R4 (71.5')	2/2
SSC-18	4/4	SSC-30	4/4
SSC-20	4/4	SSC-31	4/4
SSC-23	4/4	SSC-32	4/4
SSC-24	6/6	SSC-46	4/4
SSC-26	4/4	SSC-88	4/4
SSC-27	4/4	SSC-114	4/4
		Roberts Spring	4/4
SSC-1A	4/4	SSC-6C-R2 (77.5')	2/2
SSC-3A	4/4	SSC-6C-R3 (90')	2/2
SSC-4A	4/4	SSC-6C-R4 (118.5')	2/2
		SSC-6C-R5 (195')	2/2
		SSC-6C-R6 (283')	1/1
REM-1	4/4	SSC-3B	6/6
SSC-2B	4/4	SSC-4B	4/4
		SSC-6B	4/4

Notes:

ft bmp – feet below measuring point

Multilevel Waterloo Systems installed in SSC-3A, SSC-6C and SSC-29 in March 2015.

No shading – UFSB wells

Light Blue – SBR wells

Light Orange – DBR wells

In 2014, the RP recommended reducing the 1,4-dioxane sampling frequency from quarterly to annual and reducing the number of wells to ones with detections plus downgradient wells. In July 2014, the Agencies approved the recommendation with the condition that two additional wells be added. The two wells are SSC-27 for the UFSB and SSC-3B for the DBR. SSC-3A is the furthest downgradient SBR well. The 1,4-dioxane sampling events determined that the leading edge of the 1,4-dioxane concentrations in the UFSB and SBR had migrated to the southern portion of Area 2 and sampling will continue as approved by the Agencies including the two additional wells referenced above.

C. Vapor Intrusion Evaluation

For the upcoming FFS and incorporated HHRA, the RP and the Agencies identified the need to complete a quantitative vapor intrusion evaluation for on-site and off-site, as per the EPA VI Technical Guidance. The RP collected additional groundwater and shallow soil samples during the FMSSE 18 event (September 2016) and the Supplemental Data Collection (SDC) event (October 2016) (Figure 12). Eleven temporary wells (SSC-157 through SSC-167) were installed to refine the conceptual site model for the upcoming VI

investigation and to properly delineate the lateral extent of the VOC contamination plume in the UFSB (Figure 8).

All eleven temporary wells were sampled in October 2016, and again in November 2016, (excluding SSC-161 that was dry) resulting in no positive detections of TCE or other site related VOC's (Figure 12 in SDC 2017). Detailed results and preliminary site-specific Vapor Intrusion Screening Levels (VISLs) were presented in the two aforementioned reports.

The RP has prepared a VI assessment approach that includes a conceptual site model and decision matrices that will guide the VI assessment activities. This VI Work Plan has been submitted to the Agencies and is currently undergoing review.

D. Groundwater and Surface Water Sample Results

During this FYR period, groundwater samples were collected from 40 monitoring wells, one extraction well, 19 Waterloo well intervals, one surface water location (Roberts Spring) (Figure 1), four municipal wells, and Republic's POTW's TPI and TPE. The 19 Waterloo well intervals are located in the three reconfigured wells SSC-3A, SSC-6C, and SSC-29. Except for the four Republic municipal wells that were analyzed for TCE only, all water samples were analyzed for the 34 site-specific TCL VOCs. Of the 34 TCL VOCs, only seven VOCs were detected consistently. They were TCE, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, TCE, and vinyl chloride. The water sample results reported are for this FYR period, ranging from the first (FMSSE-1) dated first quarter (March) 2012 to the latest report of FMSSE 18 dated third quarter (September) 2016 and the SDC (February 2017).

The groundwater/surface water sample results and data (Tables 26 and 27 in Appendix B, EWI email) will be discussed in reference to the three hydrogeological zones, the UFSB, the SBR and the DBR, starting from the SSC site. Due to its complexity, the UFSB is divided into the Northern Section, Middle Section and Southern Section. Roberts Spring and the Republic POTW TPI and TPE will be discussed separate, at the end of this section.

UFSB:

Total Depth of the UFSB wells ranges from 15.2' to 78.5'. The casing in the wells varies in length and have a screen length between 4' and 60+' (Tables 27-28).

The Area 1 soil treatment was completed in December 2012, and the Areas 2 and 3 soil treatments were completed in October 2015. The impact of the soil treatments for Areas 1, 2 and 3 on the VOC concentrations detected in the UFSB wells is inconclusive at this time.

UFSB North Section

The UFSB North Section includes Area 1, the former SSC property, and part of Area 2 (south of the SSC site along Main Street) (Figure 1). The on-site former extraction wells include SSC-29 (R1-R5) and SSC-6C (R1). Monitoring wells include the on-site wells SSC-9 and SSC-11 (Figure 6); the upgradient north, west and east wells MW-1, MW-2, MW-3, and MW-7; the downgradient south wells SSC-13, SSC-114, SSC-14, MW-5, and SSC-46; and the cross-gradient wells MW-4 and MW-6. SSC-6C and SSC-29, the former on-site extraction wells, were reconfigured in March 2015, with the multilevel Waterloo System. The only interval that monitors the UFSB in SSC-6C is R1, while all five intervals, R1-R5, monitor the UFSB in SSC-29. The following is a summation for the UFSB North Section wells (Table 11).

1. No site-related VOC concentrations were detected in wells MW-1 through MW-7 or SSC-14, either before or after the Areas 1, 2 and 3 treatments during this FYR period.
2. The on-site SSC-11 well is located along the southern site boundary, just inside the fence. Before the Area 1 soil source treatment, the highest TCE contamination detected was reported in the December 2013 sampling event. After treatment, the lowest TCE contamination detected was in June 2015 and the highest TCE detected was in September 2016 sampling event (Table 11), which could imply potential rebound. Continued sampling is recommended to determine future trends.
3. The SSC-29 well was installed as an on-site UFSB extraction well. It was reconfigured in March 2015 into 5 intervals (SSC-29-R1 through SSC-29-R5), with all five intervals monitoring the UFSB. TCE, 1,1,1-TCA, and cis-1,2-DCE were the primary VOCs detected in the well before and after reconfiguration (Table 12).
4. The SSC-6C well was installed as an on-site SBR extraction well. It was reconfigured in March 2015 into 7 intervals (SSC-6C-R1 through SSC-6C-R7), with only one interval (SSC-6C-R1) monitoring the UFSB, and SSC-6C-R2 through SSC-6C-R7 monitoring the SBR (Table 12).

Table 11 – VOCs Detected in UFSB North Section Wells

Well #	VOC Detected	Lowest VOC Concentration Before Treatment*	Highest VOC Concentration Before Treatment*	Lowest VOC Concentration After Treatment	Highest VOC Concentration After Treatment
SSC-9	TCE	non-detect since 03/12	N/A	non-detect since 09/15	N/A
SSC-11	TCE	861 µg/l (12/14)	13,900 µg/l (12/13)	26.4 µg/l (06/15)	70,700 µg/l (09/16)
	1,1,1-TCA	36.3 µg/l (08/12)	3,740 µg/l (03/14)	4,830 µg/l (09/16)	7,750 µg/l (06/15)
	cis-1,2-DCE	87.2 µg/l (12/14)	3,610 µg/l (12/13)	25.7 µg/l (06/15)	19,600 µg/l (12/15)
	1,1-DCE	17.4 µg/l (03/12)	25.5 µg/l (08/12)	22.9 µg/l (06/15)	1,100 µg/l (09/16)
	1,1,2-TCA	33.2 µg/l (02/13)	960 µg/l (03/14)	110 µg/l (03/16)	155 µg/l (12/15)
	1,1-DCA	11.2 µg/l (08/12)	194 µg/l (03/14)	244 µg/l (10/15)	380 µg/l (09/16)
	PCE	non-detect	8.9 µg/l (06/13)	non-detect	18.5 µg/l (06/15)
	Vinyl Chloride	non-detect	15.5 µg/l (08/12)	non-detect since 03/15	N/A
SSC-13	TCE	198 µg/l (10/15)	467 µg/l (08/12)	non-detect since 10/15	N/A
	cis-1,2-DCE	76.1 µg/l (03/15)	391 µg/l (08/12)	8.7 µg/l (04/16)	27.2 µg/l (12/15)
	Vinyl Chloride	non-detect	N/A	4.1 µg/l (09/16)	24.9 µg/l (12/15)
SSC-46	TCE	1.0 µg/l (12/13)	8.2 µg/l (10/15)	non-detect since 09/15	N/A
	cis-1,2-DCE	1.3 µg/l (06/13, 03/14)	20.5 µg/l (10/15)	non-detect since 09/15	N/A
SSC-114	TCE	35.7 µg/l (06/13)	2,820 µg/l (10/15)	non-detect since 09/15	N/A
	cis-1,2-DCE	61.6 µg/l (06/15)	1,940 µg/l (10/15)	1.8 µg/l (09/16)	104 µg/l (12/15)
	Vinyl Chloride	4.9 µg/l (09/13)	22.9 µg/l (10/15)	3.6 µg/l (04/16)	116 µg/l (12/15)

Note:* During this Fifth FYR period
N/A – Not applicable, no value

Table 12 – VOCs Detected in Wells Before and After Reconfiguration

Well #	VOC Detected	Lowest VOC Concentration Before Reconfiguration*	Highest VOC Concentration Before Reconfiguration *	Lowest VOC Concentration After Reconfiguration	Highest VOC Concentration After Reconfiguration
SSC-6C	TCE	2,840 µg/l (04/12)	7,620 µg/l (02/12)	2,150 µg/l (04/15)(R1)	4,260 µg/l (09/16)(R1)
	cis-1,2-DCE	2,700 µg/l (04/12)	5,970 µg/l (02/12)	1,980 µg/l (04/15)(R1)	3,510 µg/l (10/15)(R1)
	Vinyl Chloride	non-detect	44.9 µg/l (09/14)	118 µg/l (04/15)(R1)	170 µg/l (03/16)(R1)
SSC-29	TCE	600 µg/l (08/12)	3,230 µg/l (06/13)	20.3 µg/l (04/15)(R3)	3,730 µg/l (03/16)(R3)
	1,1,1-TCA	7 µg/l (02/12)	118 µg/l (06/13)	2.3 µg/l (04/15)(R3)	162 µg/l (03/16)(R3)
	cis-1,2-DCE	233 µg/l (02/12)	2,050 µg/l (06/13)	505 µg/l (09/16)(R1)	1,010 µg/l (06/15)(R1)
	1,1-DCE	6.7 µg/l (08/12)	25.9 µg/l (03/14)	9.9 µg/l (09/16)(R1)	18.5 µg/l (04/15)(R1)
	1,1-DCA	non-detect	3.4 µg/l (08/12)	9.1 µg/l (09/16)(R1)	12.9 µg/l (04/15)(R1)
	Vinyl Chloride	non-detect	N/A	7.5 µg/l (04/15)(R1)	11.4 µg/l (01/16)(R1)

Note: * During this Fifth FYR period
N/A – Not applicable, no value

UFSB Middle Section

The UFSB Middle Section includes part of Area 2 and all of Area 3 from Mill Street to Brooks Street. After the December 2011, fire, TCE and cis-1,2-DCE concentrations in many UFSB wells were impacted by seasonal fluctuations until the Areas 2 and 3 treatments were implemented and completed in October 2015. The UFSB off-site extraction well is SSC-30.

The monitoring wells are SSC-65, SSC-32, SSC-12, SSC-20, SSC-21, SSC-24, SSC-88, and SSC-18. SSC-3A, the former SBR off-site monitoring well, was reconfigured in March 2015, with the multilevel Waterloo System. Intervals R1 and R2 monitor the UFSB in SSC-3A, while intervals R3-R7 monitors the SBR. Monitoring wells SSC-23 and SSC-28 are off and east of Main Street and monitoring wells SSC-15 and SSC-16 are off and west of Main Street. The following is a summation for the UFSB Middle Section monitoring wells (Table 13).

1. No VOCs were detected in wells SSC-3A-R2, SSC-15, SSC-16, or SSC-28, either before or after Areas 2 and 3 treatments during this FYR period.

2. The SSC-3A well was constructed as an SBR monitoring well. It was reconfigured in March 2015 into 7 intervals (SSC-3A-R1 through SSC-3A-R7), with the first two intervals (SSC-3A-R1 and SSC-3A-R2) monitoring the UFSB. TCE and cis-1,2-DCE were the only VOCs detected in the well before reconfiguration and in SSC-3A-R1 (04/15 through 09/16) after reconfiguration, while not detected in SSC-3A-R2 (04/15 through 09/16) after reconfiguration (Table 14).
3. The SSC-23 well is located 2 blocks east of Main Street and all VOCs were non-detect until December 2013, when TCE was detected at 1.3 µg/l. TCE concentrations ranged from 1.2 µg/l (06/14 and 06/15) to 1.7 µg/l (03/15 and 09/15) before treatment. Since treatment, TCE has increased from 1.9 µg/l (09/15) to 2.3 µg/l (09/16). The increasing trend could be due to a combination of the well's distance from the Areas 2 and 3 treatment area and/or the length of the well's screen of 25.57' (Table 27).

Table 13 – VOCs Detected in UFSB Middle Section Wells

Well #	VOC Detected	Lowest VOC Concentration Before Treatment*	Highest VOC Concentration Before Treatment*	Lowest VOC Concentration After Treatment	Highest VOC Concentration After Treatment
SSC-12	TCE	1,050 µg/l (03/14)	15,300 µg/l (08/12)	1.8 µg/l (08/16)	327 µg/l (12/15)
	cis-1,2-DCE	30.5 µg/l (03/14)	380 µg/l (11/12)	14.5 µg/l (09/16)	5,900 µg/l (12/15)
	Vinyl Chloride	non-detect	N/A	4.4 µg/l (03/16)	33.7 µg/l (12/15)
SSC-18	TCE	2.1 µg/l (02/13)	86.1 µg/l (10/15)	21.6 µg/l (12/15)	52.7 µg/l (09/16)
	cis-1,2-DCE	1.7 µg/l (03/14)	40.2 µg/l (10/15)	6.7 µg/l (12/15)	32.0 µg/l (09/16)
SSC-20	TCE	343 µg/l (10/15)	4,400 µg/l (03/12)	non-detect (09/16)	13.1 µg/l (12/15)
	cis-1,2-DCE	14.8 µg/l (03/14)	121 µg/l (08/12)	60.4 µg/l (12/15)	109 µg/l (03/16)
	Vinyl Chloride	non-detect	N/A	2.1 µg/l (09/16)	33.9 µg/l (03/16)
SSC-21	TCE	384 µg/l (10/15)	2,010 µg/l (03/12)	non-detect	4.1 µg/l (12/15)
	cis-1,2-DCE	13.9 µg/l (03/14)	188 µg/l (03/12)	7.8 µg/l (09/16)	41.6 µg/l (12/15)
	Vinyl Chloride	non-detect	N/A	2.0 µg/l (09/16)	19.4 µg/l (03/16)
SSC-23	TCE	1.2 µg/l (06/14,06/15)	1.7 µg/l (03/15,09/15)	1.9 µg/l (12/15)	2.3 µg/l (09/16)
SSC-24	TCE	167 µg/l (08/12)	777 µg/l (06/13)	495 µg/l (09/16)	580 µg/l (12/15)
	cis-1,2-DCE	148 µg/l (12/13)	684 µg/l (08/12)	178 µg/l (09/16)	291 µg/l (12/15)
SSC-30	TCE	161 µg/l (03/14)	677 µg/l (02/13)	1.5 µg/l (03/16)	4.4 µg/l (12/15)
	cis-1,2-DCE	12.7 µg/l (06/15)	166 µg/l (08/12)	2.9 µg/l (03/16)	16.8 µg/l (12/15)
	Vinyl Chloride	non-detect		4.4 µg/l (03/16)	33.7 µg/l (12/15)
SSC-32	TCE	72.5 µg/l (10/15)	138 µg/l (03/12)	4.2 µg/l (12/15)	27.6 µg/l (09/16)
	cis-1,2-DCE	68.1 µg/l (06/14)	114 µg/l (02/13)	37.6 µg/l (12/15)	71.4 µg/l (09/16)
	Vinyl Chloride	non-detect	N/A	1.9 µg/l (04/16)	7.5 µg/l (12/15)
SSC-65	TCE	364 µg/l (09/14)	5,540 µg/l (06/14)	19.4 µg/l (04/16)	55.9 µg/l (12/15)
	cis-1,2-DCE	9.0 µg/l (12/14)	59.9 µg/l (12/13)	170 µg/l (04/16)	556 µg/l (09/16)
	Vinyl Chloride	non-detect	N/A	110 µg/l (09/16)	204 µg/l (04/16)
SSC-88	TCE	315 µg/l (12/14)	931 µg/l (11/12)	182 µg/l (03/16)	529 µg/l (12/15)
	cis-1,2-DCE	5.9 µg/l (09/13)	11.4 µg/l (11/12)	5.0 µg/l (03/16)	9.1 µg/l (12/15)

Note: * During this Fifth FYR period
N/A – Not applicable, no value

Table 14 – VOCs Detected in Well Before and After Reconfiguration

Well #	VOC Detected	Lowest VOC Concentration Before Reconfiguration*	Highest VOC Concentration Before Reconfiguration*	Lowest VOC Concentration After Reconfiguration	Highest VOC Concentration After Reconfiguration
SSC-3A	TCE	7.5 µg/l (12/13)	19.5 µg/l (09/14)	3.3 µg/l (03/16)(R1)	11.3 µg/l (10/15)(R1)
	cis-1,2-DCE	2.4 µg/l (12/13)	11.3 µg/l (09/14)	2.3 µg/l (10/15)(R1)	2.5 µg/l (10/15)(R1)

Note: * During this Fifth FYR period
N/A – Not applicable, no value

UFSB South Section

The UFSB South Section includes the UFSB monitoring wells SSC-17, SSC-19, SSC-25, SSC-26, SSC-27, and the UFSB extraction well SSC-31 south of Brooks Street. Monitoring wells SSC-19 and SSC-25 are off and east of Main Street and SSC-17 is off and west of Main Street. The following is a summation for the UFSB South Section monitoring and extraction wells (Table 15).

1. No VOCs were detected in monitoring wells SSC-17, SSC-19, and SSC-25 during this FYR period and SSC-17 was dry during the September 2016 sampling event.
2. SSC-26, SSC-27, and SSC-31 had detections of TCE in every sampling event during this FYR period.
3. The SSC-31 well is the only remaining operational extraction well for the SSC site since the December 2011 fire. Due to its distance from the SSC site, the extracted groundwater from SSC-31 discharges directly into Republic's sewer system. SSC-26 and SSC-27 (monitoring wells) are grouped with SSC-31 (extraction well) and are the furthest downgradient UFSB wells. The three wells form the UFSB sentinel cluster and verify the operational status of the SSC remedial action. The well cluster is located just north Highway 60 (Figure 1). Based on the operational data obtained during this FYR, there appears to be no definitive capture effectiveness or trend regarding the containment of the VOC contamination in the UFSB groundwater (Figure 22).

Table 15 – VOCs Detected in UFSB South Section Wells

Well #	VOC Detected	Lowest VOC Concentration	Highest VOC Concentration
SSC-3A	TCE	7.5 µg/l (12/13)	19.5 µg/l (09/14)
	cis-1,2-DCE	2.4 µg/l (12/13)	11.3 µg/l (09/14)
SSC-26	TCE	1.4 µg/l (12/15)	23.2 µg/l (08/12)
	cis-1,2-DCE	1.0 µg/l (05/12)	1.6 (11/12)
SSC-27	TCE	1.1 µg/l (03/15 & 12/15)	11.0 µg/l (11/12)
	cis-1,2-DCE	1.0 µg/l (11/12 & 09/13)	1.4 (05/12)
SSC-31	TCE	1.7 µg/l (02/13)	23.0 µg/l (12/12)

SBR:

Total Depth of the SBR wells ranges from 79' to 285', are cased to the top of the Northview Shale (~ 300') and have a screen length between 5' and 18' (Tables 25 and 26 in Appendix A).

The SBR wells include the former on-site extraction wells REM-2 and SSC-6C's lower six intervals (SSC-6C-R2 through SSC-6C-R7). The off-site monitoring wells include SSC-3A's lower five intervals (SSC-3A-R3 through SSC-3A-R7) and SSC-4A. The Area 1 soil treatment was completed in December 2012, and the Areas 2 and 3 soil treatments were completed in October 2015. The impact of the soil treatments for Areas 1, 2 and 3 on the VOC concentrations detected in the SBR wells is inconclusive at this time (Table 16).

1. No VOCs were detected in monitoring wells SSC-3A-R4 and SSC-4A during this FYR period.
2. The REM-2 well was constructed as an on-site SBR extraction well. Area 1 soil blending was completed in December 2012. TCE and cis-1,2-DCE concentrations were detected in every sampling event during this FYR period. However, the TCE and cis-1,2-DCE concentrations were lower than the previous five years (before the December 2011, fire), since REM-2 functioned as a monitoring well instead of as an extraction well during this FYR period.
3. The SSC-3A well was reconfigured into 7 intervals (SSC-3A-R1 through SSC-3A-R7). The first two intervals (SSC-3A-R1 and SSC-3A-R2) are monitoring the UFSB and the remaining five intervals (SSC-3A-R3 through SSC-3A-R7) are monitoring the SBR. Except for three detections of cis-1,2-DCE in interval SSC-3A-R6 and was one detection of cis-1,2-DCE in interval SSC-3A-R7, all other VOCs were non-detect in the reconfigured well (Tables 17-18).
4. The SSC-6C well was reconfigured into 7 intervals (SSC-6C-R1 through SSC-6C-R7), with the first interval SSC-6C-R1 monitoring the UFSB and the remaining six intervals (SSC-6C-R2 through SSC-6C-R7) monitoring the SBR. TCE and cis-1,2-

DCE concentrations were detected in all six SBR intervals for every sampling event between April 2015 and September 2016 (Tables 17-18).

Table 16 – VOCs Detected in SBR Wells

Well #	VOC Detected	Lowest VOC Concentration Before Treatment	Highest VOC Concentration Before Treatment	Lowest VOC Concentration After Treatment	Highest VOC Concentration After Treatment
REM-2	TCE	1,090 µg/l (09/14)	3,330 µg/l (03/13)	1,920 µg/l (03/15)	3,350 µg/l (09/15)
	cis-1,2-DCE	92.1 µg/l (05/12)	436 µg/l (12/14)	325 µg/l (03/15)	611 µg/l (09/15)
	trans-1,2-DCE	non-detect	2.3 µg/l (03/13)	20.4 µg/l (09/15)	37.8 µg/l (06/15)
	1,1-DCA	non-detect	26.2 µg/l (03/13)	14.9 µg/l (09/16)	22.4 µg/l (09/15)
	1,1-DCE	25.5 µg/l (11/12)	32.6 µg/l (03/13)	18.8 µg/l (09/16)	28.0 µg/l (09/15)

Table 17 – VOCs Detected in Wells Before Reconfigured

Well #	VOC Detected	Lowest VOC Concentration Before Reconfiguration	Highest VOC Concentration Before Reconfiguration
SSC-3A	TCE	7.5 µg/l (12/13)	19.5 µg/l (09/14)
	cis-1,2-DCE	2.4 µg/l (12/13)	11.3 µg/l (09/14)
SSC-6C	TCE	2,840 µg/l (04/12)	7,620 µg/l (02/12)
	1,1,1-TCA	56.4 µg/l (12/13)	141 µg/l (02/12)
	cis-1,2-DCE	2,700 µg/l (04/2012)	6,770 µg/l (10/11)
	trans-1,2-DCE	166 µg/l (09/13)	289 µg/l (12/14)
	1,1-DCE	non-detect	61.6 µg/l (06/14)
	1,1-DCA	122 µg/l (02/12)	39 µg/l (09/14)
	1,1,2-TCA	non-detect	2.8 µg/l (09/14)
	PCE	non-detect	2.5 µg/l (09/14)
	Vinyl Chloride	non-detect	44.9 µg/l (09/14)

Table 18 – VOCs Detected in Wells After Reconfigured

Well #	VOC Detected	Lowest VOC Concentration After Reconfiguration	Highest VOC Concentration After Reconfiguration
SSC-3A-R6	cis-1,2-DCE	1.1 µg/l (03/16)	1.7 µg/l (01/16)
SSC-3A-R7	cis-1,2-DCE	non-detect	1.1 µg/l (09/16)
SSC-6C-R2	TCE	14 µg/l (06/15)	39 µg/l (10/15)
	cis-1,2-DCE	62.6 µg/l (04/15)	119 µg/l (10/15)
	1,1,1-TCA	non-detect	1.3 µg/l (04/15)
	trans-1,2-DCE	non-detect	2.7 µg/l (04/15)
SSC-6C-R3	TCE	16.8 µg/l (03/16)	21 µg/l (06/15)
	cis-1,2-DCE	43.2 µg/l (04/15)	98.5µg/l (06/15)
	1,1,1-TCA	non-detect	1.3 µg/l (06/15)
	trans-1,2-DCE	1.4 µg/l (03/16)	1.6 µg/l (04/15)
	Vinyl Chloride	non-detect	1.3 µg/l (06/15)
SSC-6C-R4	TCE	12.4 µg/l (06/15)	28.7 µg/l (09/16)
	cis-1,2-DCE	45.9 µg/l (04/15)	95.8 µg/l (03/16)
	1,1,1-TCA	non-detect	1.5 µg/l (04/15)
	trans-1,2-DCE	1.4 µg/l (04/15)	2.4 µg/l (03/16)
SSC-6C-R5	TCE	6.9 µg/l (01/16)	48.8 µg/l (04/15)
	cis-1,2-DCE	99.4 µg/l (06/15)	149 µg/l (09/16)
	1,1,1-TCA	non-detect	3.3 µg/l (04/15)
	trans-1,2-DCE	2.0 µg/l (03/16)	3.9 µg/l (04/15)
	1,1-DCA	non-detect	1.2 µg/l (04/15)
SSC-6C-R6	TCE	6.0 µg/l (10/15)	91.2 µg/l (06/15)
	cis-1,2-DCE	72.9 µg/l (04/15)	171 µg/l (06/15)
SSC-6C-R7	TCE	4.0 µg/l (10/15))	22.7 µg/l (04/15)
	cis-1,2-DCE	140 µg/l (06/15)	304 µg/l (04/15)
	1,1,1-TCA	non-detect	1.4 µg/l (04/15)
	trans-1,2-DCE	1.8 µg/l (10/15)	4.5 µg/l (04/15)
	1,1-DCA	non-detect	2.3 µg/l (04/15)
	Vinyl Chloride	non-detect	11.4 µg/l (09/16)

DBR:

Total Depth of the DBR wells ranges from 600' to 1204', are cased through the Northview Shale (~300'), and are open borehole below Northview Shale (Tables 26-27 in Appendix B).

The DBR includes the former on-site extraction well REM-1 and the on-site monitoring well SSC-6B. The off-site wells include the monitoring wells SSC-2B, SSC-3B, SSC-4B, and the city of Republic wells CW-3, CW-4, CW-5, and CW-6. The Area 1 soil treatment was completed in December 2012, and the Areas 2 and 3 soil treatments were completed in October 2015.

Based on the construction of the DBR wells, the Areas 1, 2 and 3 soil treatments potentially had no impact on the VOC concentrations detected in the on-site (REM-1 and SSC-6B) and off-site (SSC-2B, SSC-3B, and SSC-4B) DBR wells, or any of the Republic municipal wells (CW-3, CW-4, CW-5, and CW-6) (Table 19).

Table 19 – VOCs Detected in DBR Wells

Well #	COCs Detected	Lowest COC Concentration	Highest COC Concentration	# of Events w/ Detections
REM-1	TCE	38.2 µg/l (04/12)	126 µg/l (11/12)	All
	cis-1,2-DCE	26.2 µg/l (04/12)	92.9 µg/l (12/12 & 12/14)	All
	trans-1,2-DCE	1.7 µg/l (03/16)	5.6 µg/l (06/2015)	7
	1,1-DCA	1.2 µg/l (02/12)	3.0 µg/l (11/2012)	All except 2
	1,1-DCE	1.4 µg/l (03/16)	2.0 µg/l (12/14 & 09/16).	All except 3
SSC-3B	TCE	2.2 µg/l (02/12)	5.5 µg/l (09/16)	All
SSC-6B	TCE	non-detect	1.8 µg/l (09/13)	Once

Roberts Spring:

Roberts Spring, which is a surface water feature, serves as the SSC site's sentinel monitoring location for the UFSB's discharge. Roberts Spring is known to be hydraulically connected to the UFSB's groundwater and is the furthest downgradient sampling/monitoring location for the SSC site. No VOCs were detected in the spring's water samples at this location during this FYR period.

E. Area 1 Groundwater and Soil Sample Results

The steady increase in site-related COC concentrations, including TCE, in Area 1 wells (groundwater) raised the question of a continuing Area 1 soil source. Since SSC-11 is screened from 13' to 23', which is through the on-site treatment interval of 15' to 24', the TCE detections within SSC-11 were indicative of TCE and other VOCs being released from the bound-up Area 1 soils before and after treatment. TCE was detected in SSC-11 at a steady increase that peaked at 1,870 µg/l in (11/12) before the Area 1 treatment in December 2012. After treatment, TCE detections began as non-detect (02/13) and have increased to 70,700 µg/l in (09/16) (Figure 6). The initial non-detects and lower TCE detections after treatment were potentially due to the residual chemical oxidant (potassium permanganate) within SSC-11.

Fifty-four soil samples were collected from thirteen soil borings in Area 1 during October 2016 (Figure 7). The soil samples were collected to address the Area 1 data gaps, which were to determine the overall effectiveness of the treatment actions on the Area 1 soil concentrations (horizontally and vertically to bedrock), to identify the presence of continuing soil source(s), and collect soil data (horizontally and vertically to bedrock) to input into a HHRA.

The soil samples were collected in each boring and analyzed using the TCL VOC from the following depths:

- 0' to 3' bls for evaluation of exposure by direct contact;
- 3' to 10' bls for evaluation of exposure to future construction workers; and
- 10' to bedrock (Table 20) to evaluate possible residual concentrations that may differ from the concentrations in the shallower intervals (MRAC, 2017).

**Table 20- Area 1 Soil Borings and Monitoring Wells
Total Depths and Lithology Encountered**

Temporary Boring #	Total Depth & Lithology Encountered	Temporary Wells #	Total Depth & Lithology Encountered	Permanent Wells #	Total Depth & Lithology Encountered
SSC-142	14.5' Weathered LS	SSC-157	18.0' Weathered LS	SSC-150	26.0' Silty Clay
SSC-143	21.0' Weathered LS	SSC-158	14.5' Weathered LS	SSC-155	20.0' Weathered LS
SSC-144	23.5' Weathered LS	SSC-159	16.5' Weathered LS	SSC-156	15.0' Weathered LS
SSC-145	22.0' Weathered LS	SSC-160	14.5' Weathered LS	SSC-168	13.0' Weathered LS
SSC-146	22.0' Weathered LS	SSC-161	14.8' Weathered LS		
SSC-147	19.0' Weathered LS	SSC-162	12.5' Weathered LS		
SSC-148	20.0' Weathered LS	SSC-163	13.5' Weathered LS		
SSC-149	21.5' Weathered LS	SSC-164	14.5' Weathered LS		
SSC-150A	26.5' Silty Clay *	SSC-165	15.0' Weathered LS		
SSC-151	19.0' Weathered LS	SSC-166	19.5' Weathered LS		
SSC-152	20.3' Weathered LS	SSC-167	13.0' Weathered LS		
SSC-153	20.2' Weathered LS				
SSC-154	20.0' Weathered LS				

Notes: * Odor detected at 26.0'; black staining detected between 9.0' – 26.0'.

All thirteen soil borings had detections of TCE with some having one or more detections of 1,1,1-TCA, cis-1,2-DCE, and vinyl chloride. The TCE concentrations ranged from 0.104 mg/kg (2' to 2.5' bls in SSC-153) to 7,250 mg/kg (26' to 26.5' bls in SSC-150). There were eight borings with TCE concentrations greater than 1.0 mg/kg (Table 21), which were located in the central portion of Area 1. **Bolded** values on table are TCE detections over 1 mg/kg.

Table 21- Area 1 Temporary Soil Boring Sample Results

Boring #	COCs Detected	Lowest Concentration Detected and Depth Detected	Highest Concentration Detected and Depth Detected
SSC-142	TCE	0.174 mg/kg (2.0'-2.5')	9.52 mg/kg (13.0'-13.5')
	1,1,1-TCA	non-detect	0.432 mg/kg (7.0'-7.5')
	cis-1,2-DCE	0.0127 mg/kg (2.0'-2.5')	0.914 mg/kg (7.0' – 7.5')
SSC-143	TCE	0.011 mg/kg (2.5'-3.0')	24.7 mg/kg (12.5'-13.0')
	1,1,1-TCA	non-detect	3.54 mg/kg (12.5'-13.0')
	cis-1,2-DCE	non-detect	25.7 mg/kg (12.5'-13.0')
SSC-144	TCE	0.0397 mg/kg (2.5'-3.0')	130 mg/kg (13.0'-14.0')
	cis-1,2-DCE	0.0133 mg/kg (2.0'-2.5')	50.0 mg/kg (8.5'-9.0')
SSC-145	TCE	non-detect	0.586 mg/kg (7.0'-7.5')
	cis-1,2-DCE	non-detect	9.03 mg/kg (7.0'-7.5')
SSC-146	TCE	non-detect	0.0319 mg/kg (2.5'-3.0')
	cis-1,2-DCE	non-detect	0.0060 mg/kg (2.5'-3.0')
SSC-147	TCE	non-detect	0.122 mg/kg (13.5'-14.0')
	cis-1,2-DCE	non-detect	0.0776 mg/kg (13.5'-14.0')
SSC-148	TCE	non-detect	104 mg/kg (18.5'-19.0')
	1,1,1-TCA	non-detect	1.63 mg/kg (7.0'-7.5')
	cis-1,2-DCE	non-detect	10.2 mg/kg (18.5'-19.0')
SSC-149	TCE	0.0527 mg/kg (2.5'-3.0')	4,340 mg/kg (10.0'-11.0')
	1,1,1-TCA	non-detect	13.9 mg/kg (8.5'-9.0')
	cis-1,2-DCE	non-detect	455 mg/kg (10.0'-11.0')
SSC-150A	TCE	0.0831 mg/kg (2.5'-3.0')	7,250 mg/kg (26.0'-26.5')
	1,1,1-TCA	non-detect	13.9 mg/kg (8.5'-9.0')
	cis-1,2-DCE	9.03 mg/kg (8.5'-9.0')	130 mg/kg (8.5'-9.0')
SSC-151	TCE	0.0111 mg/kg (14.5'-15.0')	0.108 mg/kg (4.5'-5.0')
	cis-1,2-DCE	non-detect	0.0566 mg/kg (4.5'-5.0')
SSC-152	TCE	0.0158 mg/kg (16.0'-16.5')	2.15 mg/kg (20.0'-20.3')
	cis-1,2-DCE	non-detect	1.85 mg/kg (20.0'-20.3')
SSC-153	TCE	non-detect	2.92 mg/kg (19.0'-20.0')
	cis-1,2-DCE	non-detect	1.06 mg/kg (19.0'-20.0')
SSC-154	TCE	non-detect	0.0332 mg/kg (2.5'-3.0')
	cis-1,2-DCE	non-detect	0.0082 mg/kg (13.5'-14.0')

Based on the soil sample results, eleven temporary wells (SSC-157 through SSC-167) and four permanent wells (SSC-150, SSC-155, SSC-156, and SSC-168) were installed on-site (Area 1) to collect additional groundwater data from the unconsolidated zone in the treatment area (Table 22, Figure 7). For the eleven temporary wells, groundwater samples were collected during two sampling events on October 18, 2016 and November 8, 2016. All eleven temporary wells were sampled in October 2016; however, only ten wells were sampled in November 2016, since SSC-161 was dry. All site-related VOC concentrations, including TCE and cis-1,2 DCE, were non-detect. For the four permanent

wells, groundwater samples were collected for only one sampling event in October 2016; however, all four well were sampled with the following results:

Table 22 – Groundwater Results from Area 1 New Monitoring Wells

Well #	Depth Detected	VOC Detected	Highest VOC Concentration Detected
SSC-150	17'-26'	TCE	46,100 µg/l
		1,1,1-TCA	25.9 µg/l
		cis-1,2-DCE	3,140 µg/l
		1,1-DCE	20.3 µg/l
		Vinyl Chloride	240 µg/l
SSC-155	15'-20'	TCE	2,660 µg/l & 2,700 µg/l (dup);
		1,1,1-TCA	213 µg/l & 215 µg/l (dup)
		cis-1,2-DCE	2,640 µg/l & 2,580 µg/l (dup)
		1,1-DCA	193 µg/l & 200 µg/l (dup)
		1,1-DCE	55.1 µg/l & 54.2 µg/l (dup)
		Vinyl Chloride	109 & 114 µg/l (dup)
SSC-156	5'-15'	TCE	144, 000 µg/l
		1,1,1-TCA	1,060 µg/l
		cis-1,2-DCE	18,100 µg/l
		1,1-DCA	309 µg/l
		1,1-DCE	394 µg/l
		Vinyl Chloride	89.0 µg/l
SSC-168	3'-13'	TCE	27,700 µg/l
		1,1,1-TCA	1,190 µg/l
		cis-1,2-DCE	46,800 µg/l
		1,1-DCA	1,420 µg/l
		1,1-DCE	240 µg/l
		Vinyl Chloride	489 µg/l

The VOC concentrations detected in the groundwater sample results from the new Area 1 wells (10/16) resembled the sample data from SSC-11 during FMSSE #18 (09/16) and correlated with the TCE concentrations detected in Area 1 soils. In locations with the highest TCE concentrations in soil (SSC-149 and SSC-150), the TCE concentrations in groundwater were highest among the new wells, ranging from 46,100 µg/l (SSC-150 well, located at soil boring SSC-150) to 144,000 µg/l (SSC-156 well, located near soil boring SSC-149).

The lowest TCE concentrations reported among the four new Area 1 wells was 2,700 µg/l (SSC-155 well, located near SSC-143), which had a correspondingly-lower TCE concentration in soil (MRAC, 2017).

TCE concentrations in the shallower wells (SSC-156 and SSC-168) were an order of magnitude higher than in their proximal deeper wells. This corresponds to the TCE concentrations in soil at SSC-143, SSC-144, and SSC-149, where the highest TCE concentrations were reported at depths between 10 to 13 feet bls, while TCE concentrations were one to two orders of magnitude lower in samples from near the bedrock surface. Contrary to this relationship, the highest TCE concentration in soil reported during these field activities were near the bedrock surface in soil boring SSC-150, whereas the groundwater concentration in monitoring well SSC-150 was an order of magnitude lower than in the proximal shallower well (SSC-156) (MRAC, 2017).

The TCE concentrations in SSC-152, which is located near SSC-11, do not correlate well with groundwater concentrations at SSC-11 at 70,700 µg/L (09/16). TCE concentrations in soil was relatively low, ranging from non-detect to 2.92 mg/kg at the 19' to 20' depth (adjacent to bedrock), which corroborates the relatively-lower TCE concentrations in soil reported during the SSI; however, it does not explain the increased VOC concentration observed at the SSC-11 well (MRAC, 2017).

In addition to TCE, other VOCs detected at significant concentrations at SSC-11 were also detected in the new Area 1 wells, including 1,1-DCA, 1,1-DCE, c-1,2-DCE, 1,1,1-TCA, and vinyl chloride. These VOCs were generally reported at concentrations comparable to those reported at SSC-11 in September 2016. The presence of c-1,2-DCE and vinyl chloride at significant concentrations indicates that some degree of natural reductive dechlorination is occurring in an oxidizing environment. This is important since c-1,2-DCE and vinyl chloride do not typically bioaccumulate.

Groundwater sample results indicate that even though the dissolved oxygen is elevated above levels typical of reductive environments in all four wells, the negative ORP in monitoring wells SSC-155 (-75) and SSC-168 (-35) has more influence on the natural conditions creating the reductive conditions in this area, contrary to the conditions farther south at SSC-150 (12.8) and SSC-156 (79). Thus, the data indicates that degradation is occurring in the northern portion of the Area 1 treatment area (MRAC, 2017).

F. Areas 2 and 3 Pilot Program

The Areas 2 and 3 injections were completed in October 2015. Groundwater data from UFSB and SBR wells located within Areas 2 and 3 suggest that the enhanced reductive dechlorination or ISB for Areas 2 and 3 is still actively reducing the VOC contamination (Section D. Groundwater and Surface Water Sample Results).

Soil sampling of Areas 2 and 3 will not be conducted until the ISB activities are completed in 2017, or 2018, and will be evaluated as part of the FFS.

V. Technical Assessment

QUESTION A: Is the remedy functioning as intended by the decision documents?

Remedy Performance

The 1989 Record of Decision assumed removal actions addressed all soil contamination and the selected remedy was limited to groundwater extraction and treatment, institutional controls, and monitoring. A fire destroyed the groundwater treatment system in 2011 and since that time, the SSC site has been addressed under a FM/ED Agreement. Investigations are currently underway to gather data to complete an FFS.

The SSC-31 well is the only remaining operational extraction well for the SSC site since the December 2011 fire. Due to its distance from the site, the extracted groundwater from SSC-31 discharges directly into Republic's sewer system. SSC-26 and SSC-27 (monitoring wells) are grouped with SSC-31 (extraction well) and are the furthest downgradient UFSB wells. The three wells form the UFSB sentinel cluster and verify the operational status of the SSC remedial action. The well cluster is located just north Highway 60 (Figure 1). Based on the operational data obtained during this FYR, there appears to be no definitive trend regarding the containment of the VOC contamination in the UFSB groundwater (Figure 22).

Groundwater Monitoring

Groundwater sampling continues to assess the nature and extent of the groundwater plume in the three distinct water bearing units and determines what activities need to be conducted to achieve groundwater RAOs. Sampling during the FMSSEs (#1-#18) (2017) and SDC Report (2017) suggest the southern plume boundary for the UFSB has remained stable. VOC concentrations have fallen to non-detect levels since September 2014, in the furthest downgradient monitoring well for the SBR (SSC-3A Waterloo intervals R3, R4, R5, R6, and R7); however, continued monitoring will be required. The furthest downgradient DBR monitoring well (SSC-3B) detected TCE concentrations in every FMSSE ranging from 2.2 µg/l (02/12) to 5.5 µg/l (09/16), so continued monitoring will be required.

Source Investigation and Pilot Studies

Pilot projects in Areas 1, 2, and 3 continue to be conducted to address residual soil contamination and results will be used to in the pending FFS.

Implementation of Institutional Controls and Other Measures

Although the Agencies have determined that current ICs are adequate for the SSC site, it is recommended that an environmental covenant under the Missouri Environmental Covenants Act (MoECA) be placed on the SSC property as a further safeguard subject to property owner agreement.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Changes in Standards and TBCs

Have there been changes to the risk-based cleanup levels or standards identified as Applicable or Relevant and Appropriate Requirements (ARARs) in the Record of Decision (ROD) that call into question the protectiveness of the remedy?

Chemical-specific ARARs for the COCs detected in groundwater were discussed and summarized in the 1989 ROD (Table 23). Only groundwater COCs and their cleanup levels were established for the site since contaminated soil was previously excavated in areas identified as containing elevated concentrations at that time.

The chemical-specific ARARs for groundwater were identified in Appendix A of the ROD and included: Federal 40 CFR 141 (safe drinking water standards, MCLs), Missouri 10 CSR 60-4 (drinking water standards), Missouri 10 CSR 20-7 (water quality standards), and Federal ambient water quality standards for aquatic life protection. The following table shows a comparison of the federal MCLs used at the time of the 1989 ROD to current MCLs used as compliance levels presently. There have only been a few changes to MCLs and the MCL for TCE has not changed as of the date of this FYR.

Table 23 - 1989 ROD cleanup levels compared to current MCLs

COCs Identified in 1989 ROD	1989 ROD Cleanup Levels (µg/L)	Current MCLs (µg/L)
1,1-DCA	5 (proposed MCL)	NA
1,1-DCE	7	7
cis-1,2-DCE	Not included in original COC list	70
trans-1,2-DCE	70 (MCLG)	100
Methylene Chloride	NA	5
1,1,1-TCA	200	200
TCE	5	5
Vinyl Chloride	2	2

Are there newly promulgated standards that call into question the protectiveness of the remedy?

For this FYR period, the Agencies are not aware of any newly promulgated standards that would call into question the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for contaminants of concern at the site changed in a way that could affect the protectiveness of the remedy?

Several toxicity factors have changed since the baseline HHRA was conducted in 1989. Most notably, a revised toxicological review for TCE completed in 2011 determined that TCE is a human carcinogen and significantly revised its carcinogenic and non-carcinogenic toxicity values. As part of the upcoming FFS, a revised HHRA will be completed utilizing current toxicity values.

Have other contaminant characteristics changed in a way that could affect the protectiveness of the remedy?

During this FYR period, the Agencies are not aware of other changes to contaminant characteristics.

Changes in Risk Assessment Methods

Human Health

The HHRA conducted in 1989 and included as part of the RI/FS determined that no unacceptable health risks were currently present since the UFSB and SBR were not used as a source of drinking water and CW-1 (DBR) had been removed from service. However, the HHRA concluded that future use of on-site and off-site groundwater from any of the three aquifers could pose unacceptable health risks.

The HHRA was conducted using the Superfund Public Health Evaluation Manual (SPHEM) (EPA 1986), while current practice is to use EPA's Risk Assessment Guidance for Superfund (RAGS) methodology. While much of the methodology has changed over the years, the most significant is that the process for selecting chemicals to be evaluated in the HHRA was modified.

Selection of "indicator chemicals" under the old guidance potentially allowed for more chemicals to be eliminated than would be eliminated using current methodology as described in RAGS for selecting "chemicals of potential concern."

A variety of other risk assessment methodologies have changed, such as the standardized methodologies for dermal and inhalation risk assessment along with a variety of changes to standard default exposure parameters.

Once additional groundwater and soil sampling is complete and the vapor intrusion pathway has been investigated, a re-evaluation of the RAOs will be conducted as part of the FFS. The FFS will include the completion of a revised Human Health Risk Assessment (HHRA) that will address applicable changes in toxicity data, risk assessment methodology, and exposure pathways that have occurred since the time of the original remedy.

Ecological Risk

The fourth FYR report focused on identifying ecological benchmarks for surface water, since Roberts Spring is the site's sentinel monitoring location for discharge from the UFSB. Although water quality criteria is not available for all site-related contaminants, other ecological benchmarks for surface water can be used. These values are not ARARs; however, they do provide a means for determining potential ecological risk. Additionally, the lack of a value implies that a contaminant is not being evaluated for potential ecological risk, and we have found that this approach can be problematic.

Table 24 below provides ecological screening levels for surface water in Robert's Spring. The majority of the values are based on EPA Region 5 Ecological Screening Levels (EPA, 2003). However, a National Ambient Water Quality Criterion (NAWQC) is available for acrolein (EPA, 2009); therefore, that value is provided. Values based on Suter and Tsao (1996) are provided for contaminants that do not have a Region 5 ESL. Overall, recent sampling data indicates that spring water in Robert's Spring is not impacted by site-related contaminants (although, it was noted that detection limits for acrolein are above the NAWQC).

Table 24 - Ecological Screening Levels for Surface Water

Contaminant	ESL (µg/L)	Contaminant	ESL (µg/L)
Acrolein	3 ¹	1,3-Dichloropropylene	244 ²
Benzene	114	1,4-Dioxane	22,000
Bis(2-ethylhexyl) Phthalate	912 ²	Ethylbenzene	320
Butyl Benzyl Phthalate	23	Isophorone	920
Chlorobenzene	47	Methyl Chloride	42,667 ²
Chloroethene (Vinyl Chloride)	930	Methylene Chloride	940
Chloroform	140	Phenol	100
1,1-Dichloroethane	47	Tetrachloroethylene	45
1,1-Dichloroethene	65	Toluene	253
1,2-Dichloroethane	910	1,1,1-Trichloroethane	76
<i>cis</i> -1,2-Dichloroethylene	970 ³	Trichloroethylene	47
<i>trans</i> -1,2-Dichloroethylene	970	1,1,2-Trichloroethane	500
1,2-Dichloropropane	360		

Notes:

- 1 – Value based on National Ambient Water Quality Criteria (EPA, 2009).
- 2 – Value based on Suter and Tsao (1996).
- 3 – Surrogate value is provided: *trans*-1,2-dichloroethylene is used as a surrogate for *cis*-1,2-dichloroethylene.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed (i.e., industrial to residential, commercial to residential)?

During this FYR period, land use at the SSC site and the surrounding area has not changed and the Agencies are not aware of any potential future land use changes on or near the SSC site.

Have any human health or ecological routes of exposure or receptors changed or been newly identified (e.g., dermal contact where none previously existed, new populations or species identified on site or near the site) that could affect the protectiveness of the remedy?

Given the volatility of contaminants at the SSC site, vapor intrusion has been identified as a potential exposure pathway needing evaluation. Plans are currently underway to conduct a detailed vapor intrusion investigation and to determine whether or not vapor intrusion is a complete exposure pathway.

Are there newly identified contaminants or contaminant sources?

Newly identified soil source areas were documented during the fourth FYR. During the current FYR, treatment was conducted in Area 1 in December 2012 and in Areas 2 & 3 in October 2015. Remediation is ongoing in Areas 1, 2 & 3 and is expected to continue throughout 2017. Once this is completed, additional groundwater and soil sampling will be conducted to assess the treatment effectiveness and to support the updated risk assessment.

An emerging issue at older groundwater contaminated sites is the presence of 1,4-dioxane. Sampling for 1,4-dioxane was conducted during this FYR and concentrations exceeding risk-based screening levels were identified.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the decision documents (e.g., byproducts not evaluated at the time of the remedy selection)?

The Agencies are not aware of any unanticipated toxic byproducts of the remedy not previously addressed by the decision documents.

Have physical site conditions or the understanding of these conditions changed in a way that could affect the protectiveness of the remedy?

For this FYR, the Agencies are not aware of any changes in physical site conditions or understanding of these conditions.

QUESTION C: Has any **other** information come to light that could call the protectiveness of the remedy into question?

No.

VI. Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
None				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): Sitewide/OU1	Issue Category: Remedy Performance			
	Issue: Re-evaluate progress towards achieving RAOs.			
	Recommendation: Re-evaluate progress towards achieving RAOs after cleanup/removal of soil source areas.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	State/EPA	12/31/2018
OU(s): Sitewide/OU1	Issue Category: Changed Site Conditions			
	Issue: Delineate horizontal and vertical limits of UFSB, SBR and DBR plumes.			
	Recommendation: Install additional monitoring wells in the UFSB, SBR and DBR, where needed, to confirm the horizontal and vertical plume boundaries.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
*	Yes	PRP	State/EPA	12/31/2018
OU(s): Sitewide/OU1	Issue Category: Monitoring			
	Issue: Vapor Intrusion evaluation needs to be conducted			
	Recommendation: Conduct quantitative vapor intrusion (VI) study to evaluate the VI pathway.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
*	Yes	PRP	State/EPA	12/31/2018

* The effect of these issues on current protectiveness is not known at this time.

OU(s): Sitewide/OU1	Issue Category: Changed Site Conditions			
	Issue: Remediate/remove soil source areas			
	Recommendation: Treat/remove the three VOC contaminated soil source areas..			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	State/EPA	9/28/2018
OU(s): Sitewide/OU1	Issue Category: Institutional Controls			
	Issue: Implement additional institutional controls (ICs).			
	Recommendation: Implement additional ICs by recording an environmental covenant (EC) with the SSC property's chain of title.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Other –subject to property owner agreement	State/EPA	3/29/2019
OU(s): Sitewide/OU1	Issue Category: Changed Site Conditions			
	Issue: Assure compliance with and implementation of work required by Force Majeure/Excusable Delay (FM/ED) Agreement.			
	Recommendation: Investigate and remediate the soil source areas and groundwater, and conduct a Focused Feasibility Study under the FM/ED Agreement.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	State/EPA	3/29/2019

VII. Protectiveness Statement

Protectiveness Statement(s)		
<i>Operable Unit:</i> OU1	<i>Protectiveness Determination:</i> Protectiveness Deferred	<i>Planned Addendum Completion Date:</i> 4/1/2021
<i>Protectiveness Statement:</i> A protectiveness determination of the remedy cannot be made at this time until further information is obtained, under the FM/ED agreement and after associated delineation and pilot study activities are completed. Further data and information will be obtained by taking the following actions: completing a Focused Feasibility Study and an updated Human Health Risk Assessment including a comprehensive vapor intrusion study of all structures overlying and near potentially impacted groundwater, delineating the groundwater plume in all three groundwater units, and evaluating the effectiveness of ongoing soil source area pilot studies. It is expected that these actions will take approximately 3.5 years to complete, at which time a protectiveness determination will be made.		

Sitewide Protectiveness Statement		
<i>Operable Unit:</i> Sitewide	<i>Protectiveness Determination:</i> Protectiveness Deferred	<i>Planned Addendum Completion Date:</i> 4/1/2021
<i>Protectiveness Statement:</i> A protectiveness determination of the remedy cannot be made at this time until further information is obtained, under the FM/ED agreement and after associated delineation and pilot study activities are completed. Further data and information will be obtained by taking the following actions: completing a Focused Feasibility Study and an updated Human Health Risk Assessment including a comprehensive vapor intrusion study of all structures overlying and near potentially impacted groundwater, delineating the groundwater plume in all three groundwater units, and evaluating the effectiveness of ongoing soil source area pilot studies. It is expected that these actions will take approximately 3.5 years to complete, at which time a protectiveness determination will be made.		

VIII. Next Review

The next five-year review report for the Solid State Circuits Superfund Site is required five years from the completion date of this review.

Reference List Relevant Documents Reviewed

The following documents were reviewed in completing the fifth FYR:

- AECOM, *Supplemental Work Plan for Areas 2 and 3, Characterization and Treatability Investigation (Revised)*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, September 24, 2014.
- AECOM and EWI, *Area 1 Pilot Program Work Plan for In Situ Soil Blending Treatment*, Solid States Circuits, Inc. Superfund Site, Republic, Missouri, June 8, 2012.
- AECOM and EWI, *Pilot Program for In-Situ Soil Blending Treatment Final Report*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, April 21, 2015.
- AECOM and EWI, *1-4-Dioxane Monitoring Events #1 and #2 (revised April 9, 2014)*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, April 9, 2014.
- AECOM and EWI, *1-4-Dioxane Monitoring Events #3 and #4*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, June 23, 2014.
- AECOM and EWI, *Areas 2 and 3 Supplemental Characterization and Treatability Investigation Report*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, June 30, 2015.
- AECOM and EWI, *Force Majeure Supplemental Sampling Event 13 Report*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, June 30, 2015.
- AECOM and EWI, *Areas 2 and 3 Pilot Program Work Plan*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, August 19, 2015.
- AECOM and EWI, *Areas 2 and 3 Pilot Program Work Plan Addendum – Phase II Design Refinement*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, September 29, 2015.
- AECOM and EWI, *Force Majeure Supplemental Sampling Events 14 and 15 Report*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, November 2015.
- AECOM and EWI, *1-4-Dioxane Monitoring Event #5*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, January 2016.
- AECOM and EWI, *Areas 2 and 3 Pilot Program Injection Completion Report*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, February 9, 2016.
- AECOM and EWI, *Areas 2 and 3 Pilot Program Data Evaluation Report*, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, May 31, 2016.

AECOM and EWI, *Force Majeure Supplemental Sampling Events 16 and 17 Report, Solid State Circuits, Inc. Superfund Site, Republic, Missouri*, June 30, 2016.

AECOM and EWI, *Supplemental Data Collection Work Plan, Solid State Circuits, Inc. Superfund Site, Republic, Missouri*, August 30, 2016.

AECOM and EWI, *Fifth Five-Year Performance Report, Solid State Circuits, Inc. Superfund Site, Republic, Missouri*, September 30, 2016.

AECOM and EWI, *Force Majeure Supplemental Sampling Event 18 Report, Solid State Circuits, Inc. Superfund Site, Republic, Missouri*, January 31, 2017.

AECOM and EWI, *Supplemental Data Collection Report, Solid State Circuits, Inc. Superfund Site, Republic, Missouri*, February 23, 2017.

AECOM and EWI, *Well and Equipment Information, Republic, Missouri site and Screen Intervals, Solid State Circuits, Inc. Superfund site, Republic Missouri as email attachments*, June 13, 2017.

AECOM and EWI, *Force Majeure Supplemental Sampling Event 19 Report, Solid State Circuits, Inc. Superfund Site, Republic, Missouri*, July 31, 2017.

Black & Veatch, *Feasibility Study, Republic, Missouri Site*, July 1989.

Chatman and Associates, Inc., *Combined Quarterly Hydraulic Performance Report, Semi-Annual Chemical Monitoring Report, and Five-Year Performance Report for the Republic, Missouri Site*, February 20, 1996.

EWI, *Supplemental Site Investigation Report, Solid State Circuits, Inc. Superfund Site, Republic, Missouri, Volume I*, revised April 20, 2011.

EWI, *Fourth Five-Year Performance Report*, September 30, 2011.

EWI, *Volume VII of the 100% Remedial Design Document Package, Remedial Action Site Safety and Health Plan, Solid State Circuits, Inc. Superfund Site, Republic, Missouri*, March 30, 2012.

EWI, *Supplemental Combined Sampling and Analysis Plan/Quality Assurance Project Plan for the Areas 2 and 3 Supplemental Characterization and Treatability Investigation Report, Solid State Circuits, Inc. Superfund Site, Republic, Missouri*, September 24, 2014.

Geraghty & Miller, Inc., *Combined Detailed Site Investigation Plan and Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Solid State Circuits, Inc., Republic, Missouri*, May 26, 1987.

Geraghty & Miller, Inc., *Remedial Investigation Report for the Republic, Missouri Site*, June 9, 1989.

McLaren/Hart Environmental Engineering Corporation, *100% Remedial Design Document Package; Volume III - Remedial Action Operation and Maintenance Plan*, October 5, 1992.

McLaren/Hart Environmental Engineering Corporation, *100% Remedial Design Document Package; Volume V - Remedial Action Contingency Plan*, October 5, 1992.

MoDNR, *Fourth Five-Year Review Report, Solid State Circuits, Inc. Superfund Site, Republic, Greene County, Missouri*, September 21, 2012.

MoDNR, *Agreement for Additional Reasonably Necessary Time Regarding Force Majeure/Excusable Delay*, June 15, 2012. Amended December 8, 2014 and March 13, 2015.

US District Court for the Western District of Missouri, Southern Division, *Consent Decree*, July 1990 (entered by the court May 31, 1991); with the *Remedial Design/Remedial Action, Statement of Work for Republic, Missouri Site*, July 1990 attached.

USEPA, *EPA Superfund Record of Decision: Solid State Circuits, Inc. EPA ID: MOD980854111, OU 01, Republic, MO, EPA/ROD/R07-89/026* 1989, September 27, 1989.

USEPA, *OLEM, Five-Year Review Recommended Template*, OLEM 9200.0-89.

USEPA, *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (OSWER Pub. 9200.2-154)*, 2015.

Appendix A

Tables

Table 3- Site Chronology

Key Events	Date
SSC manufactured printed circuit boards	1968 - 11/1973
TCE discovered in CW-1 during NSOC Survey	06/1982
Agencies conducted response activities	04/1983 - 03/1984
SSC site placed on the MO <i>Registry</i>	02/22/1985
Department and PRPs conducted Removal Activities	03/1985 - 11/1985
EPA signed Action Memorandum	4/5/1985
EPA conducted Removal Activities	4/5/1985 - 10/31/1985
Multi-Site Cooperative Agreement between Agencies signed	10/01/1985
Final listing on EPA National Priorities Listing (NPL)	06/10/1986
Settlement Agreement & Consent Decree entered by Federal Court	11/20/1986
Stipulation & Joint Motion to Amend Settlement Agreement & Consent Decree entered by Federal Court	02/04/1988
SSC conducted Remedial Investigation/Feasibility Study (RI/FS)	12/1986 - 07/1989
ROD selecting the remedy was signed & executed	09/27/1989
Administrative Order for Remedial Design & Remedial Action (RD/RA) was entered by Federal Court	06/20/1990
Consent Decree/Statement of Work (CD/SOW) was signed	07/25/1990 - 11/23/1990
RD Pilot Remediation Program	09/01/1991 - 1/31/1992
100% RD Document Package (100% RDDP) was submitted	10/1992
100% RDDP approved by Department with EPA concurrence	12/22/1992
Implementation of Remedial Action (RA) Construction	01/11/1993
RA Construction completion date	09/20/1993
Preliminary Close Out Report received by the Department	12/01/1993
RA Certification Report received by the Department	05/1994
RA Operation & Maintenance (O&M) Plan approved	06/16/1994
ESD modifying UFSB and DBR chemical quality and hydraulic performance monitoring standards	10/24/1996
First FYR approved	12/12/1996
Horizontal well pilot test	2001-2002
Second FYR approved	09/20/2002
ESD to allow full operation of the horizontal well	09/2004
Gore-Sorber Soil Vapor Survey Report approved	08/28/2007
Third FYR approved	09/12/2007
Supplemental Site Investigation for soil and groundwater	11/2009 - 03/2010
Draft Pilot Program Work Plan for Soil Source Area 1 submitted	01/07/2011
Public Notice for Start of Fourth FYR Process	07/15/2011
Supplemental Site Investigation (SSI) Report approved	07/28/2011
Partial (DBR) abandonment of Republic's CW-1 well	11/08/2011
Groundwater Pump and Treat Facility fire and limited site visit	12/08/2011
Fourth FYR Report approved	09/21/2012
Public Notice for Start of Fifth FYR	07/26/2016
Fifth FYR site visit	10/20/2016

TABLE 4-16
Summary of 1,4-Dioxane Concentrations
Solid State Circuits, Inc. Superfund Site
Republic, Missouri

Well ID	FMSSE-6	FMSSE-7	FMSSE-8	FMSSE-9	FMSSE-13	FMSSE-17
	Jun 2013	Sep 2013	Dec 2013	Mar 2014	Mar 2015	Mar 2016
USEPA Screening Level: 6.1 µg/L						
SSC-3A-R1 (40') (3)					< 3.0	< 2.0
SSC-6C-R1 (42') (3)					< 3.0 UJ	3.40
SSC-9	< 5.8	< 0.45				
SSC-11	56.1	55.9	91.3 (1)	61.6	63.3 (2) J	77.2 (4)
SSC-12	< 5.8	< 0.45	< 3.0 (1)	< 3.0	< 3.0	< 2.0
SSC-13	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-18	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-20	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-23	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-24	< 2.9	< 0.45	< 3.0	< 3.0	< 3.0	< 2.0
SSC-26	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-27	< 2.9	< 0.45	< 3.0 (1)	< 3.0	< 3.0	< 2.0
SSC-29	< 14.5	5.30	7.20	7.90		
SSC-29-R1 (32') (3)					< 3.0 UJ	< 2.0
SSC-29-R2 (43.5') (3)						< 2.0
SSC-29-R3 (54') (3)						< 2.0
SSC-29-R4 (71.5') (3)					< 3.0 UJ	< 2.0
SSC-29-R5 (85') (3)					4.90 J	5.50
SSC-30	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-31	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-32	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-46	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-65	24.6	3.20	< 3.0	4.10	< 3.0	5.10
SSC-88	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-114	< 2.9	< 0.45	< 3.0	< 3.0		
Robert Spring	< 2.9	< 0.45	< 3.0	< 3.0		
REM-2	< 7.2	22.2	21.5	22.0	23.2	25.5
SSC-1A	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-3A	< 2.9	< 0.45	< 3.0	< 3.0	(5)	(5)
SSC-4A	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-6C	< 14.5	7.80	5.90	7.30		
SSC-6C-R2 (77.5') (3)					< 3.0 UJ	< 2.0
SSC-6C-R3 (90') (3)					< 3.0 UJ	< 2.0
SSC-6C-R4 (118.5') (3)					< 3.0 UJ	< 2.0
SSC-6C-R5 (195') (3)					< 3.0 UJ	2.40
SSC-6C-R6 (226.5') (3)						< 2.0
SSC-6C-R7 (283') (3)						4.10
REM-1	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-2B	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-3B	< 2.9	< 0.45	< 3.0	< 3.0	< 3.0	< 2.00
SSC-4B	< 2.9	< 0.45	< 3.0	< 3.0		
SSC-6B	< 2.9	< 0.45	< 3.0	< 3.0		

NOTES:

All values given in micrograms/liter (µg/L).

FMSSE - Force Majeure Supplemental Sampling Event

ft bmp - feet below measuring point

Values or detection limits above the USEPA Screening Level are in bold type.

⁽¹⁾ Sample collected in January 2014. Original sample collected in December 2013 exceeded method hold time.

⁽²⁾ Sample collected in April 2015. Original sample collected in March 2015 exceeded method hold time.

⁽³⁾ Multilevel Waterloo systems installed at SSC-3A, SSC-6C, and SSC-29 in March 2015.

⁽⁴⁾ Sample collected in May 2016. Dioxane was detected in trip blank for original sample collected in March 2016.

⁽⁵⁾ No VOCs detected in the SBR multilevel intervals; therefore, 1,4-dioxane was not analyzed in those intervals.

See UFSB for 1,4-dioxane results at SSC-3A after well reconfiguration (March 2015).

J - Analyte detected below quantitation limit; reported concentration is approximate.

UJ - Analyte not detected above detection limit; however, the reported detection limit is approximate and may not represent the actual limit of detection necessary to accurately and precisely measure the analyte in the sample.

Wells not included in annual sampling,
per MDNR July 29, 2014 letter.

UFSB
SBR
DBR

Table 25
WELL AND EQUIPMENT INFORMATION
Republic, Missouri Site

Well Location	Geological Zone	Tot Depth (bmp)	Top of Bedrock (bmp)	Casing Diam (in)	Casing Depth (bmp)	Pump Intake Depth (Ft bmp)
CW-2	DBR	1180.00	15.00	8.00	350.00	
CW-3	DBR	1228.54	38.54	10.00	452.70	
CW-4	DBR	1550.00	98.00	10.00	523.00	
CW-5	DBR					
CW-6	DBR					
AbCW-4A	SBR	248.67	16.06	16.00	23.06	NA
AbCW-4B	DBR	1163.67	16.06	6.00	361.53	NA
REM-1	DBR	601.79	24.23	6.00	322.35	511.40
REM-2	SBR	285.32	21.82	6.00	101.82	275.49
MW-1	UFSB	19.55	16.64	2.00	9.14	NA
MW-2	UFSB	15.68	13.17	2.00	5.17	NA
MW-3	UFSB	17.74	16.74	2.00	7.24	NA
MW-4	UFSB	17.91	17.40	2.00	7.40	NA
MW-5	UFSB	16.89	16.45	2.00	6.45	NA
MW-6	UFSB	20.25	19.88	2.00	9.88	NA
MW-7	UFSB	18.42	17.97	2.00	7.97	NA
SSC-1A	SBR	283.02	20.49	6.00	29.29	275.00
SSC-1B	DBR	1185.00	17.00	6.00	282.50	
SSC-2B	DBR	835		6.00	285.00	650.00
SSC-3A	SBR	280.90	22.26		27.76	
SSC-3B	DBR	1203.75	22.27	6.00	285.27	
SSC-4A	SBR	293.42	12.99	6.00	24.49	287.00
SSC-4B	DBR	1203.45	14.50	6.00	293.00	
SSC-6B	DBR	1203.32	23.29	6.00	601.39	
SSC-6C	SBR	285.71	24.74		27.74	
SSC-9	UFSB	25.37	23.18	2.00	14.42	NA
SSC-11	UFSB	22.79	23.80	2.00	13.09	NA
SSC-12	UFSB	21.19	20.79	2.00	10.79	NA
SSC-13	UFSB	20.28	19.79	2.00	14.64	NA
SSC-14	UFSB	17.34	16.81	2.00	11.76	NA
SSC-15	UFSB	17.82	16.97	2.00	12.16	NA
SSC-16	UFSB	19.98	19.43	2.00	12.28	NA
SSC-17	UFSB	17.92	17.57	2.00	12.42	NA
SSC-18	UFSB	15.09	14.66	2.00	10.51	NA
SSC-19	UFSB	15.68	14.87	2.00	12.30	NA
SSC-20	UFSB	21.99	21.55	2.00	20.20	NA
SSC-21	UFSB	19.92		2.00	10.79	NA
SSC-23	UFSB	48.11	21.34	2.00	22.54	NA
SSC-24	UFSB	59.44	19.87	2.00	22.47	NA
SSC-25	UFSB	39.06	14.70	2.00	15.30	NA
SSC-26	UFSB	49.40	22.72	2.00	23.31	NA
SSC-27	UFSB	16.55	16.44	2.00	10.77	NA
SSC-28	UFSB	20.38	19.91	2.00	14.81	NA
SSC-29	UFSB	85.32			17.85	
SSC-30	UFSB	78.48		10.00	12.00	75.75
SSC-31	UFSB	77.22		15.00	13.90	69.85
SSC-32	UFSB	17.5		2.00	11.73	NA
SSC-65	UFSB	16.00	16.00	2.00	6.00	NA
SSC-88	UFSB	60.00	15.00	4.00	20.00	NA
SSC-114	UFSB	18.00	18.00	2.00	8.00	NA
SSC-150	UFSB	28.80	29.27	2.00	19.77	NA
SSC-155	UFSB	23.00	23.84	2.00	18.04	NA
SSC-156	UFSB	18.10	24.55	2.00	8.05	NA
SSC-168	UFSB	15.60	26.11	2.00	5.61	NA

Table 26
SCREEN INTERVALS

Solid State Circuits, Inc. Superfund Site
Republic, Missouri

Well	Geological	Depth to Top	Screen Base
Location	Zone	of Screen (ft bmp)	(ft bmp)
REM-1	DBR	322.35	601.79
REM-2	SBR	101.82	285.32
MW-1	UFSB	9.14	19.14
MW-2	UFSB	5.17	15.17
MW-3	UFSB	7.24	17.24
MW-4	UFSB	7.4	17.4
MW-5	UFSB	6.45	16.45
MW-6	UFSB	9.88	19.88
MW-7	UFSB	7.97	17.97
SSC-1A	SBR	29.29	283.02
SSC-2B	DBR	285	835
SSC-3A-R1	UFSB	27	42
SSC-3A-R2	UFSB	47	63
SSC-3A-R3	SBR	83	96
SSC-3A-R4	SBR	139	154
SSC-3A-R5	SBR	184	201
SSC-3A-R6	SBR	246	258
SSC-3A-R7	SBR	268	280
SSC-3B	DBR	285.27	1203.75
SSC-4A	SBR	24.49	293.42
SSC-4B	DBR	293	1203.45
SSC-6B	DBR	601.39	1203.32
SSC-6C-R1	UFSB	27	44
SSC-6C-R2	SBR	61	79
SSC-6C-R3	SBR	83	92
SSC-6C-R4	SBR	97	120
SSC-6C-R5	SBR	180	198
SSC-6C-R6	SBR	212	228
SSC-6C-R7	SBR	268	284
SSC-9	UFSB	14.42	24.92
SSC-11	UFSB	13.09	23.89
SSC-12	UFSB	10.79	20.79
SSC-13	UFSB	14.64	19.64
SSC-14	UFSB	11.76	16.76
SSC-15	UFSB	12.16	17.16
SSC-16	UFSB	12.28	19.28
SSC-17	UFSB	12.42	17.42
SSC-18	UFSB	10.51	14.51
SSC-19	UFSB	12.3	17.3
SSC-20	UFSB	20.2	21.4
SSC-21	UFSB	10.79	19.39
SSC-23	UFSB	22.54	48.11
SSC-24	UFSB	22.47	59.44
SSC-25	UFSB	15.3	39.06
SSC-26	UFSB	23.31	49.4
SSC-27	UFSB	10.77	15.04
SSC-28	UFSB	14.81	19.81
SSC-29-R1	UFSB	17	34
SSC-29-R2	UFSB	38	46
SSC-29-R3	UFSB	49	56
SSC-29-R4	UFSB	59	74

Table 27
SCREEN INTERVALS
Solid State Circuits, Inc. Superfund Site
Republic, Missouri

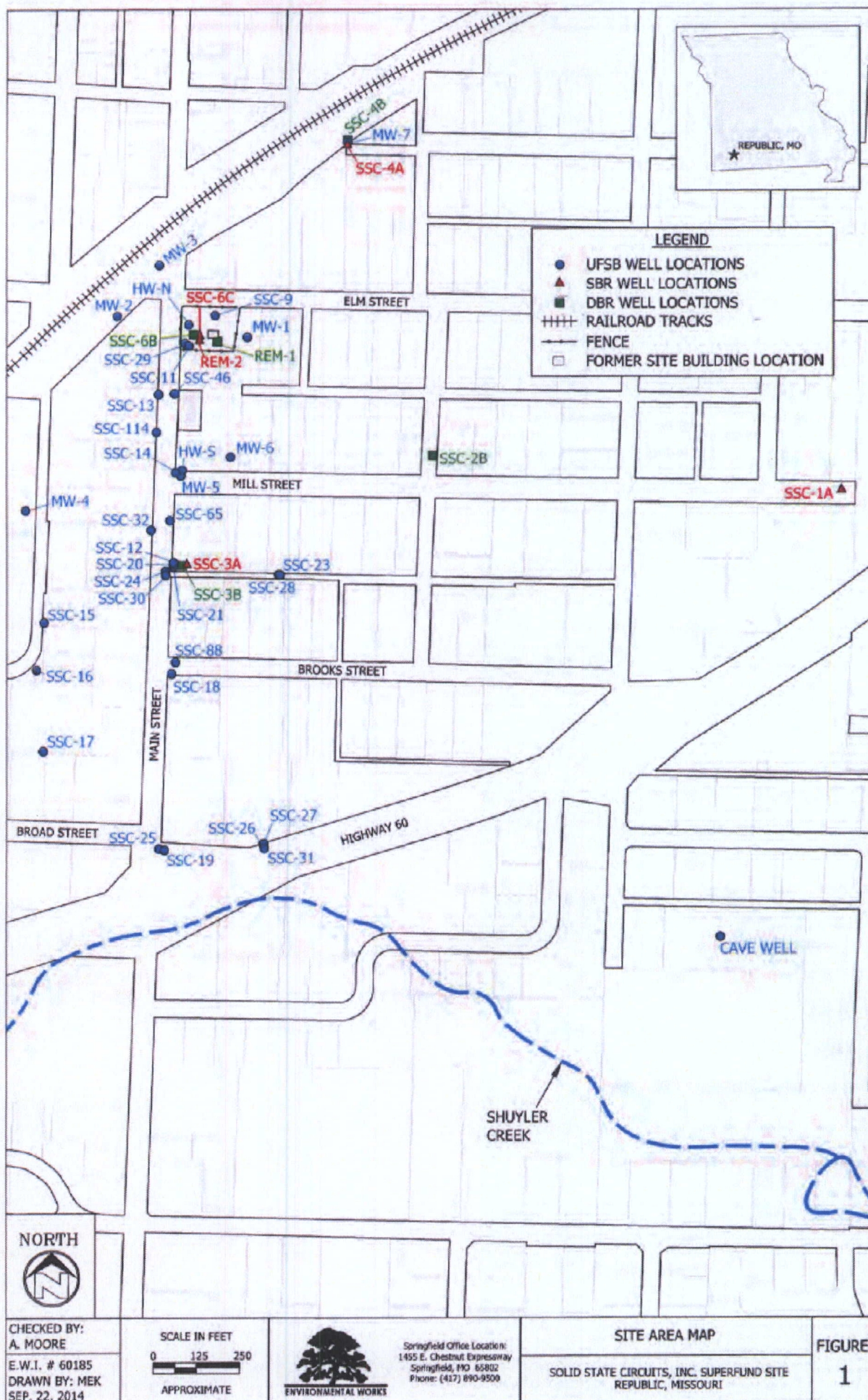
Well Location	Geological Zone	Depth to Top of Screen (ft bmp)	Screen Base (ft bmp)
SSC-29-R5	UFSB	78	86
SSC-30	UFSB	12	78.48
SSC-31	UFSB	13.9	73.58
SSC-32	UFSB	11.73	16.73
SSC-46	UFSB	9.5	19.5
SSC-65	UFSB	6	16
SSC-88	UFSB	20	60
SSC-114	UFSB	8	18
SSC-150	UFSB	19.77	28.77
SSC-155	UFSB	18.04	23.04
SSC-156	UFSB	8.05	18.05
SSC-168	UFSB	5.61	15.61

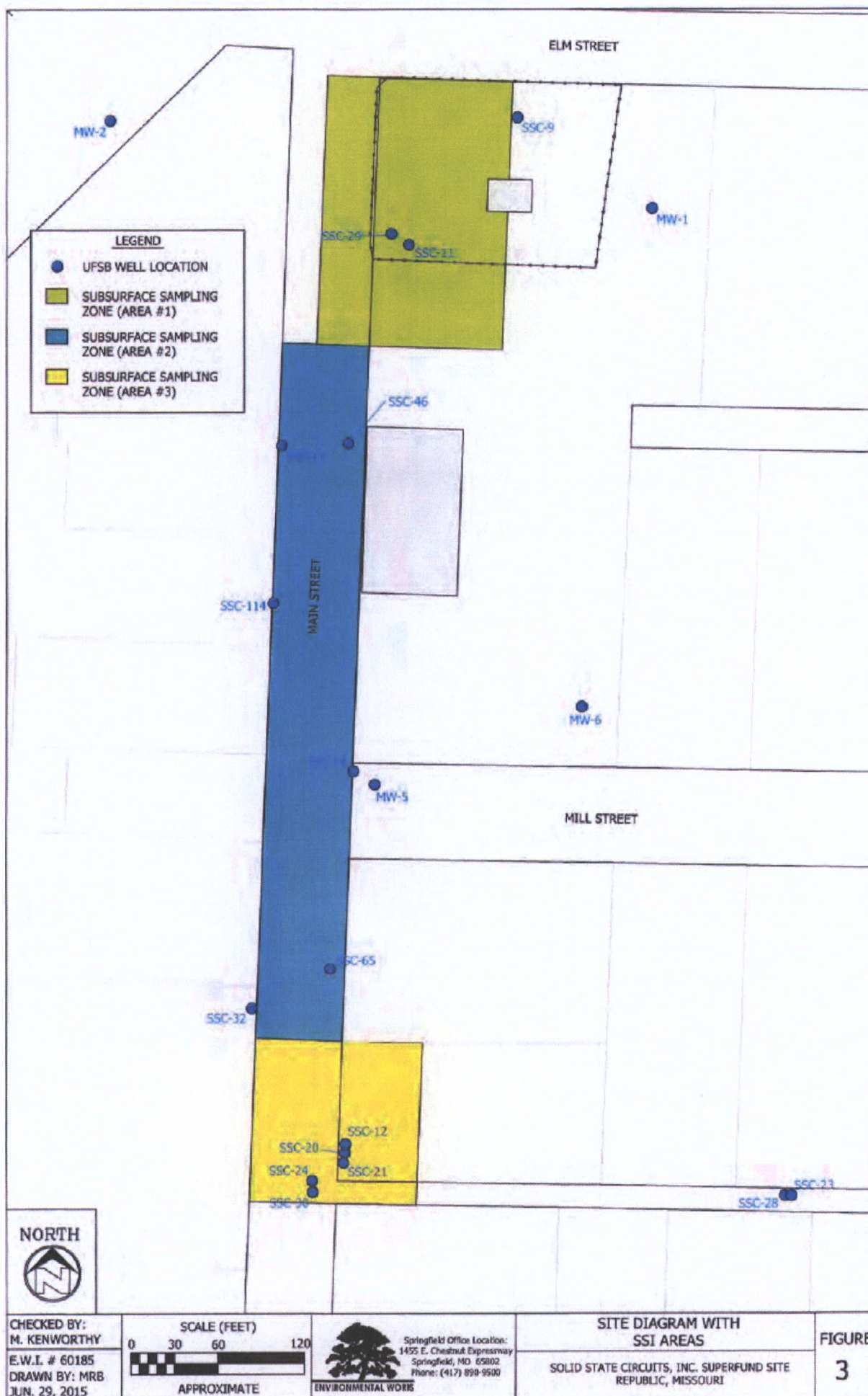
ft = feet

bmp = below measuring point

Appendix B

Figures





CHECKED BY:
M. KENWORTHY
E.W.I. # 60185
DRAWN BY: MRB
JUN. 29, 2015

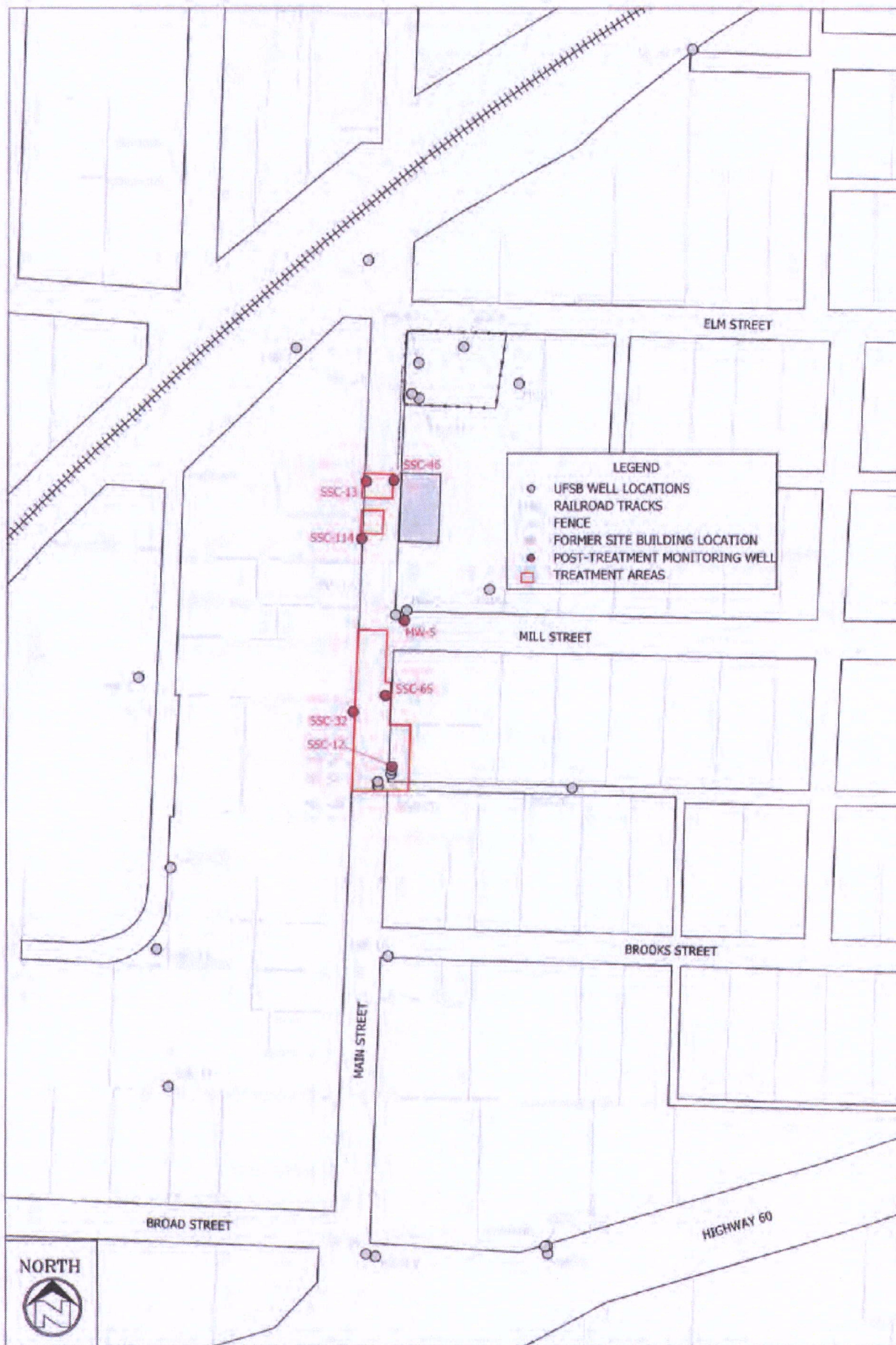
SCALE (FEET)
0 30 60 120
APPROXIMATE

Springfield Office Location:
1455 E. Chestnut Expressway
Springfield, MO 65802
Phone: (417) 899-9500

ENVIRONMENTAL WORKS

SITE DIAGRAM WITH
SSI AREAS
SOLID STATE CIRCUITS, INC. SUPERFUND SITE
REPUBLIC, MISSOURI

FIGURE
3



CHECKED BY:
A. MOORE
E.W.I. # 60185
DRAWN BY: MRB
JUN. 29, 2015

SCALE IN FEET
0 125 250
APPROXIMATE

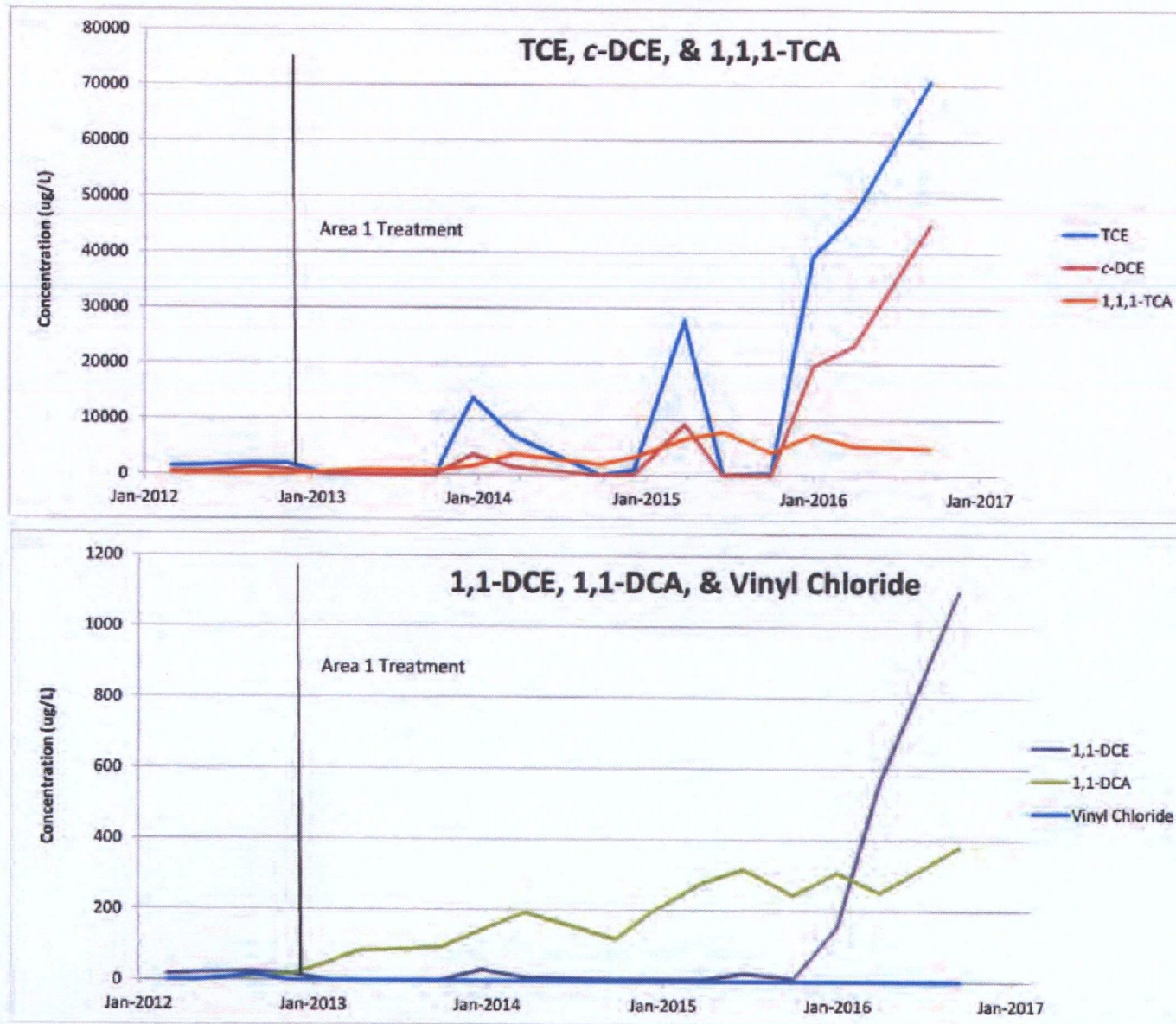


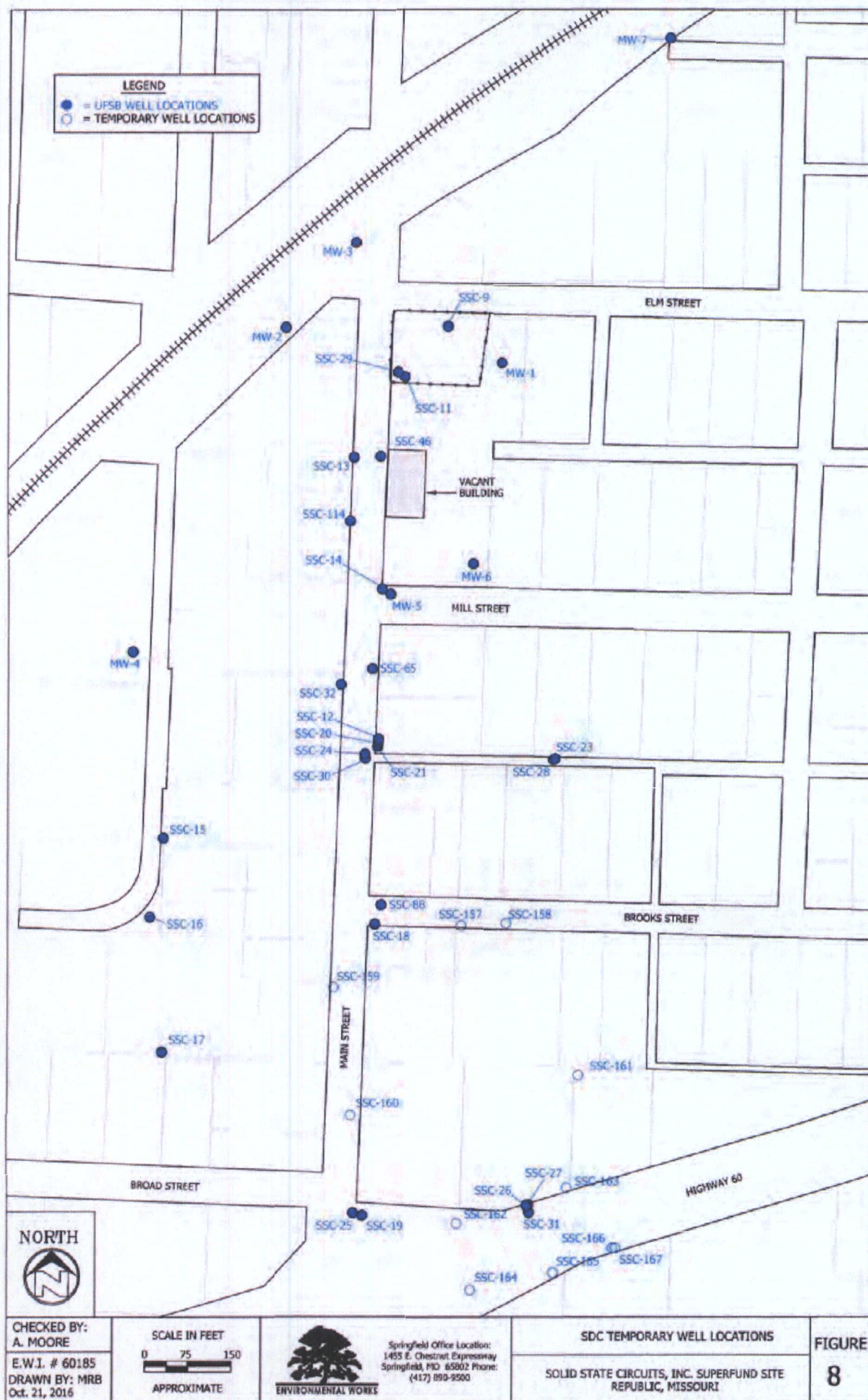
Springfield Office Location:
1455 E. Chestnut Expressway
Springfield, MO 65802
Phone: (417) 890-9500

AREAS 2/3 TREATMENT &
MONITORING LOCATIONS
SOLID STATE CIRCUITS, INC. SUPERFUND SITE
REPUBLIC, MISSOURI

FIGURE
5

FIGURE 6
COC Concentrations at SSC-11
Solid State Circuits, Inc. Superfund Site
Republic, Missouri





CHECKED BY:
A. MOORE
E.W.I. # 60185
DRAWN BY: MRB
Oct. 21, 2016

SCALE IN FEET
0 75 150
APPROXIMATE



Springfield Office Location:
1455 E. Chestnut Expressway
Springfield, MO 65802 Phone:
(417) 890-9500

SDC TEMPORARY WELL LOCATIONS
SOLID STATE CIRCUITS, INC. SUPERFUND SITE
REPUBLIC, MISSOURI

FIGURE
8

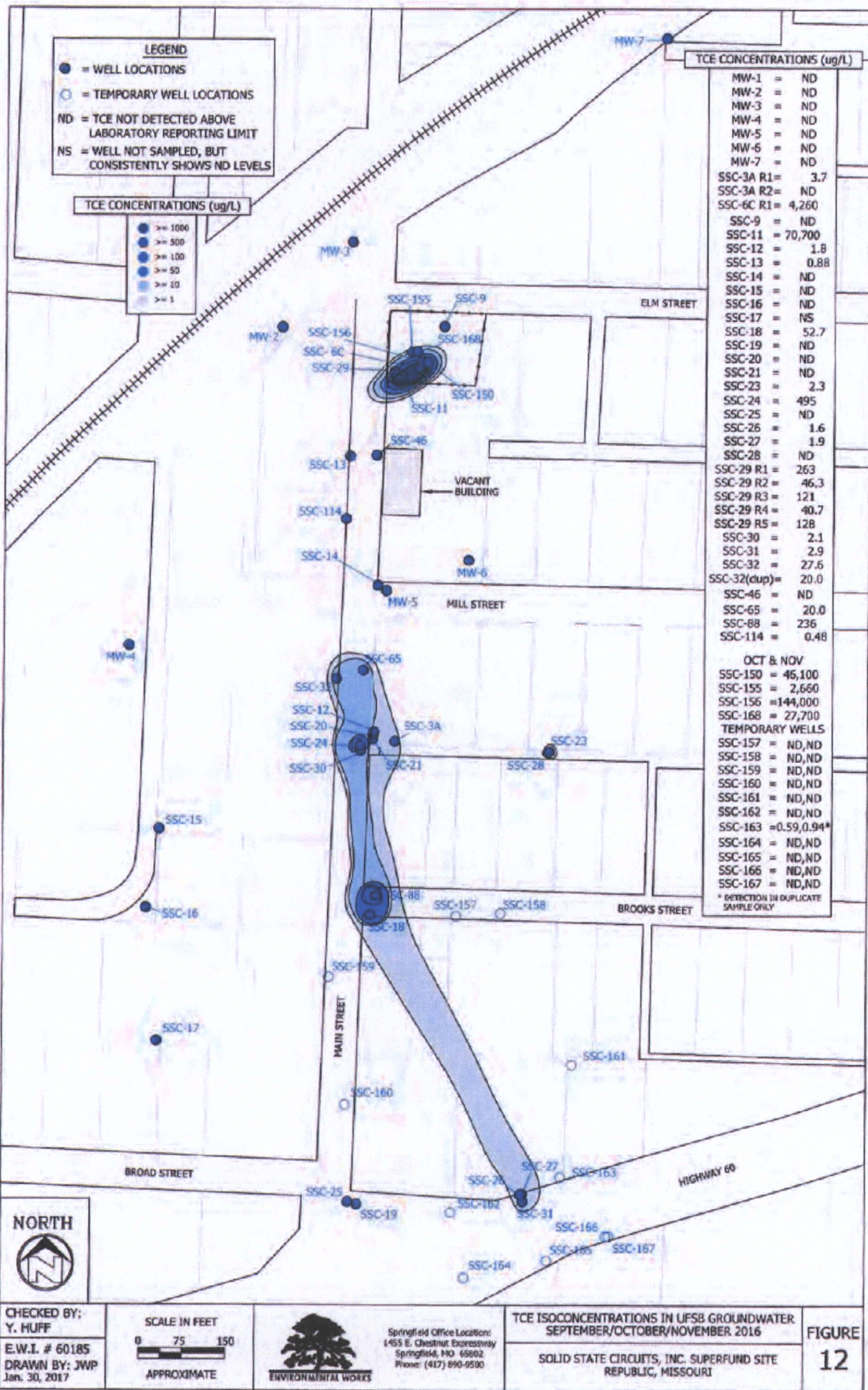
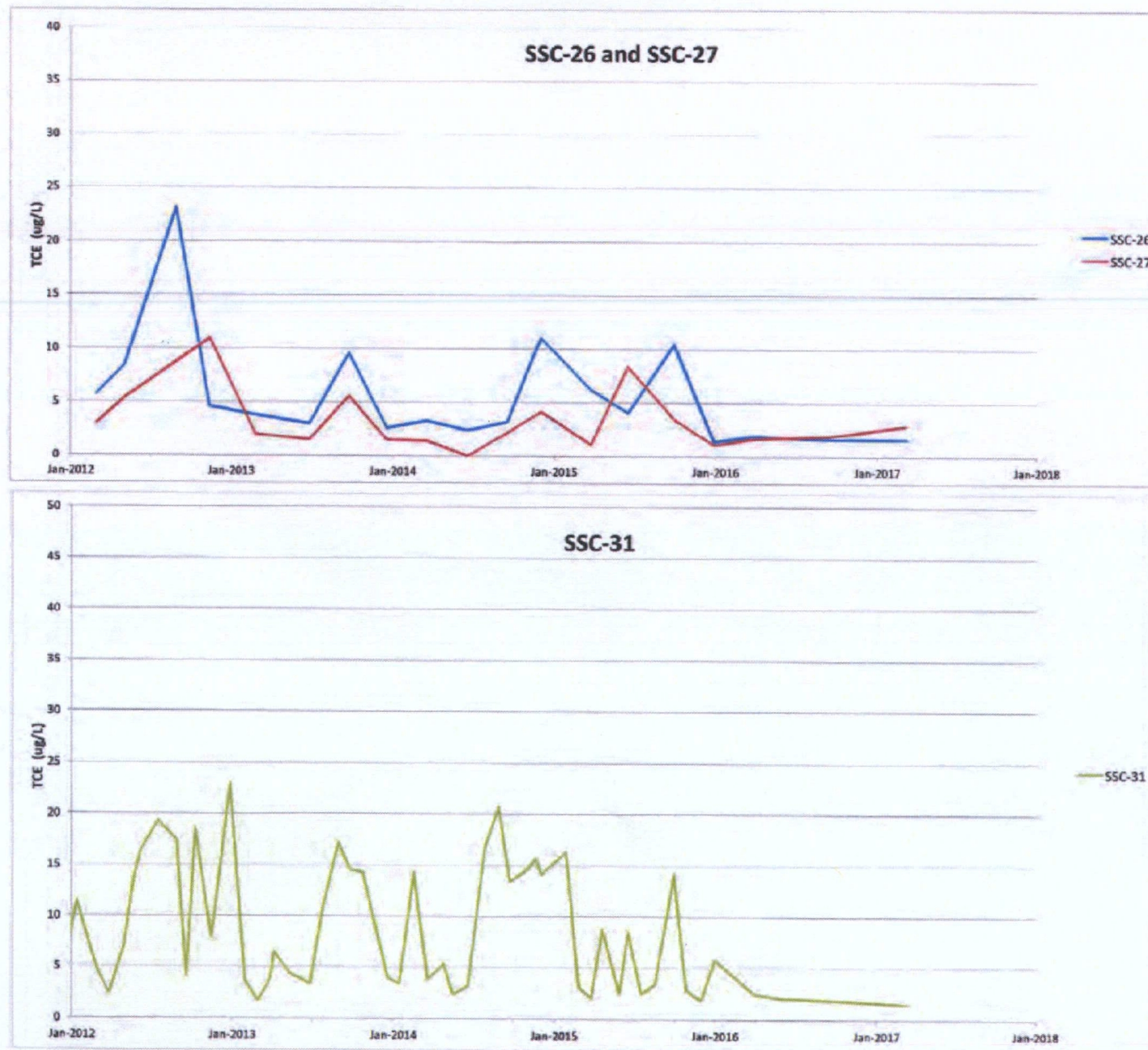


FIGURE 22
TCE Concentrations at SSC-26, SSC-27, and SSC-31
Solid State Circuits, Inc. Superfund Site
Republic, Missouri





CHECKED BY:
M. KENWORTHY
E.W.I. # 60185
DRAWN BY: MEK
AUG. 11 2011

SCALE IN FEET
0 500 1000
APPROXIMATE



Springfield Office Location:
1455 E. Chestnut Expressway
Springfield, MO 65802
Phone: (417) 890-9500

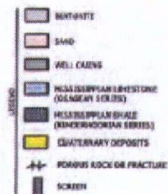
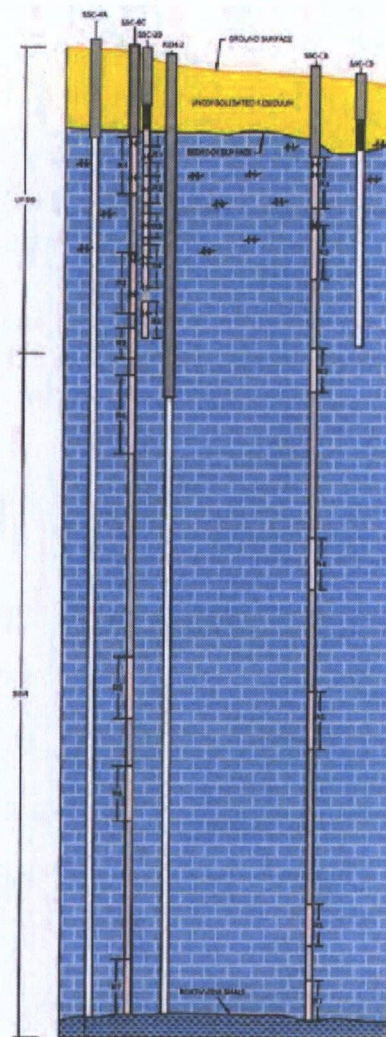
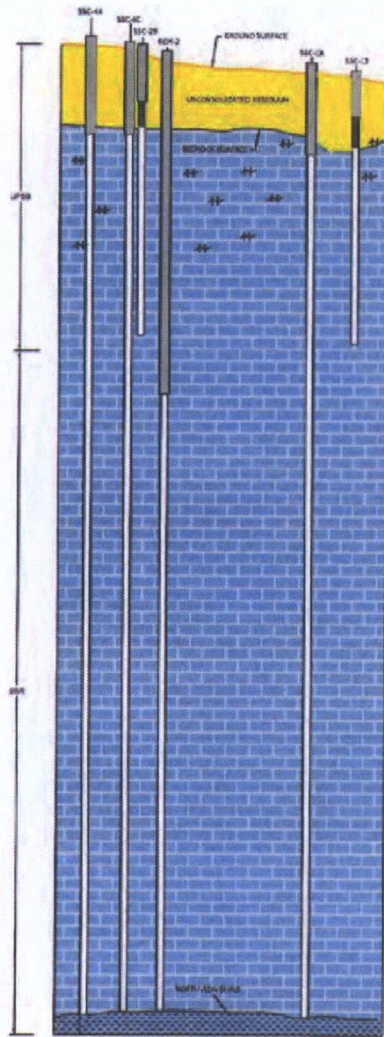
SITE LOCATION MAP

SOLID STATE CIRCUITS, INC. SUPERFUND SITE
108 S. MAIN STREET
REPUBLIC, MISSOURI

FIGURE
1-2

PRE-WATERLOO

WATERLOO CONFIGURATION



CHECKED BY:
A. MOORE
E.W.I. # 60185
DRAWN BY: CLM
Sep. 2016

SCALE IN FEET
0 125 250
VERTICAL
EXAGGERATION 11.5x



Springfield Office Location:
1455 E. Chestnut Expressway
Springfield, MO 65802
Phone: (417) 890-9500

GENERALIZED CROSS SECTION WITH
WATERLOO WELL RECONFIGURATIONS
SOLID STATE CIRCUITS, INC. SUPERFUND SITE
108 S. MAIN STREET
REPUBLIC, GREENE COUNTY, MISSOURI

FIGURE
2-5

Appendix C

Force Majeure/Excusable Delay Agreement and Modifications



Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director

DEPARTMENT OF NATURAL RESOURCES

www.dnr.mo.gov

February 9, 2012

Mr. Steve Oberkrom
MRAC, Inc.
Alcatel-Lucent
1067 NW High Point Drive
Lee's Summit, MO 64081

RE: Solid State Circuits (SSC) site Monitoring and Groundwater Sampling

Dear Mr. Oberkrom:

Thank you again for meeting with the Missouri Department of Natural Resources (MDNR) and the U.S. Environmental Protection Agency (EPA) (Agencies) on January 24, 2012, in Jefferson City, Missouri, regarding the Force Majeure/Excusable Delay site situation. The information exchanged between MRAC/EWI and the Agencies was helpful for us in understanding the current and potential future site situation. As explained by EWI, the December 8, 2011, fire totally destroyed the main on-site building that housed the air strippers and associated equipment, which were part of the SSC site's remedial action groundwater pump and treat system.

As MRAC and EWI also explained during the January 24, 2012, meeting, testing was conducted after the fire to determine the status of the on-site and off-site extraction and monitoring wells. The results indicate the wells are still functional; however, the monitoring information and sampling data must be obtained manually, since the automatic system no longer exists.

The Force Majeure/Excusable Delay event technically began with the December 8, 2011, fire. Previous on-site and off-site sampling and monitoring under the Supplemental Site Investigation (SSI) did provide a short-term (90 day) timeframe for the behavior of the contaminant plumes in the three hydrogeologic aquifers. Based on the same known timeframe, the 90 day window will expire on March 7, 2012, and a new unknown sampling/monitoring clock (window) for the contaminant plumes in the three hydrogeologic aquifers, associated with the Force Majeure/Excusable Delay event, will commence on March 8, 2012.

Since there is an approved and operational Quality Assurance Project Plan/Sampling and Analysis Plan (QAPP/SAP) for groundwater/surface water sampling procedures, analysis, etc., EWI can resume manual monitoring and sampling of the three hydrogeologic aquifers. The Agencies recommend at least one monitoring and sampling event between now and

Mr. Steve Oberkrom
Page Two

March 8, 2012, to establish a current baseline of the contaminant plumes within the three hydrogeologic aquifers. Since this is a baseline event, it is recommended that all monitoring and extraction UFSB, SBR and DBR wells, municipal wells and surface water locations (see table) be monitored and sampled to obtain early indications of any changes in plume behavior, migration and concentrations.

RA Monitoring Network Locations	Monitoring/Sampling Locations
DBR RA Extraction	REM-1
DBR Monitoring	SSC-2B, SSC-3B, SSC-4B, SSC-6B
Municipal Wells	CW-3, CW-4, CW-5, CW-6
SBR RA Extraction	REM-2, SSC-6C
SBR Monitoring	SSC-1A, SSC-3A, SSC-4A, SSC-23
UFSB RA Extraction	SSC-29, SSC-30, SSC-31
UFSB Monitoring	MW-1, MW-3, MW-4, MW-5, MW-6, MW-7, SSC-9, SSC-11, SSC-12, SSC-13, SSC-14, SSC-15, SSC-16, SSC-18, SSC-19, SSC-20, SSC-23, SSC-24, SSC-25, SSC-26, SSC-27, SSC-32, Robert's Spring

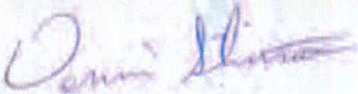
With the construction of the four new monitoring wells (SSC-46, SSC-65, SSC-88 and SSC-89) during Phase 1, they can be included in the ongoing groundwater monitoring events. Once the initial monitoring/sampling event is completed, bimonthly monitoring and sampling should be conducted until the beginning of the Pilot Program's Phase II for Area 1. With the completion and evaluation of at least two monitoring/sampling events, the Agencies can re-evaluate the schedule and well sets to determine if refinements can be made.

In the event that the VOC contaminant plumes begin to expand past the current monitoring/extraction well systems, additional measures may need to be taken to re-establish control of the three VOC contaminant plumes. These measures may include the construction of additional monitoring or extraction wells and/or the implementation of an alternative extraction system.

In order to receive Agency approval of the Pilot Project Work Plan, the substantive portion of this letter must be incorporated into the Pilot Project Work Plan. If you have any questions, please do not hesitate to contact me at the Missouri Department of Natural Resources, Hazardous Waste Program, Superfund Section, P.O. Box 176, Jefferson City, MO 65102-0176, by telephone at (573) 751-1388 or Ms. Candice McGhee, of my staff, at (573) 751-1738, or by e-mail to candice.mcgee@dnr.mo.gov.

Sincerely,

HAZARDOUS WASTE PROGRAM



Dennis Stinson, Chief
Superfund Section

Mr. Steve Oberkrom
Page Three

DS:cml

c: Mr. Andrew C. Brought, Spencer Fane Britt & Browne LLP
Mr. Dan Gravatt, U. S. EPA, Region VII
Mr. Robert Menees, Attorney General's Office
Mr. Robert Richards, U. S. EPA, Region VII Counsel
Mr. Jason Smith, Environmental Works, Inc.

**AGREEMENT FOR ADDITIONAL REASONABLY NECESSARY TIME
REGARDING FORCE MAJEURE/EXCUSABLE DELAY**

This Agreement ("Agreement") is entered into this 15 day of June, 2012, between MRAC, Inc. ("MRAC"), formerly known as Solid State Circuits, Inc. and the Missouri Department of Natural Resources ("MDNR") (collectively referred to herein as the "Parties").

RECITALS

WHEREAS, on September 27, 1989 a Record of Decision ("ROD") was finalized for the Site specifying the Superfund remedial action to be implemented at the Solid State Circuits Site ("Site") in Republic, Missouri;

WHEREAS, on July 2, 1990, Solid States Circuits, Inc. entered into a Consent Decree (U.S. Dist. Ct., W.D. Mo. Case No. 90-cv-3545) with MDNR and the U.S. Environmental Protection Agency ("EPA") (hereinafter collectively "the Agencies") regarding the Site, specifying remedial actions to be undertaken at the Site including groundwater extraction and treatment;

WHEREAS, the MDNR is the "lead agency" for the site, and the EPA is the "support agency" for the Site as those terms are defined in 40 CFR 300.5;

WHEREAS, the Statement of Work ("SOW") (Appendix 2 to the Consent Decree) specified those activities determined to be appropriate and sufficient by MDNR, the EPA, and SSC to effectively implement the selected remedy and required MRAC to implement and maintain an air stripper treatment system to achieve specific performance standards in Section 5 of the SOW that are protective of human health and the environment;

WHEREAS, on December 8, 2011, a fire destroyed the air stripper treatment system and associated equipment and building that were in operation at the Site since 1991 as part of the remedial action implemented according to the Consent Decree and ROD for the Site;

WHEREAS, on December 8, 2011, MRAC notified the Agencies by phone and in writing of the destruction of the treatment system and provided official notice of a "Force Majeure/Excusable Delay" event pursuant to Section XX of the Consent Decree, which MDNR recognized on December 29, 2011 (hereinafter "the December 2011 FM/ED Event");

WHEREAS, this Agreement is made pursuant to Paragraph 73 of the Consent Decree to document and set forth the terms and conditions for a reasonably necessary extension of time for performance of the obligations and/or subsequent obligations affected by the December 2011 FM/ED Event and for MRAC to conduct additional remedial actions pursuant to this agreement so as to protect human health and the environment at the Site;

NOW THEREFORE, in consideration of the foregoing and the mutual promises and covenants contained herein, the sufficiency of which is hereby acknowledged and subject to modification according to this Agreement, the Parties agree as follows:

TERMS & CONDITIONS

1. Definitions – The term “Work” as used in this Agreement means only the Work under this Agreement and does not mean the term “Work” as defined in the Consent Decree.
2. Pilot Program Work Plan for Area 1 – Within 30 days of the effective date of this Agreement, MRAC shall submit a “Pilot Program Work Plan for In-Situ Soil Blending Treatment for Area 1” (“Area 1 Pilot Program Work Plan”) to MDNR for review and approval. The Area 1 Pilot Program Work Plan shall include any necessary changes to the Site’s groundwater monitoring program so as to assure protection of human health and the environment. Upon receipt of MDNR’s written approval, MRAC shall perform the work in the Area 1 Pilot Program Work Plan according to the schedule contained therein.
3. Pilot Program Assessment Report for Area 1 –MRAC shall submit to MDNR for review and approval a Pilot Program Assessment Report for Area 1 describing work performed according to the MDNR approved Area 1 Pilot Program Work Plan, in accordance with the schedule for submittal contained therein, including any necessary changes to the Site’s groundwater monitoring program so as to assure protection of human health and the environment.
4. Work Plan for Areas 2 and 3 Characterization and Treatability Investigation – Within 30 days from the effective date of this Agreement, MRAC shall submit to MDNR for review and approval a Work Plan for Areas 2 and 3 Characterization and Treatability Investigation describing sampling and analyses and other work needed to fully characterize the quantities and extent of contamination in Areas 2 and 3, and for evaluation of soil cleanup alternatives. The Work Plan should include any necessary changes to the Site’s groundwater monitoring program so as to assure protection of human health and the environment. Upon receipt of MDNR’s written approval, MRAC shall perform the work in this Work Plan according to the schedule contained therein.
5. Report for Areas 2 and 3 Characterization and Treatability Investigation –MRAC shall submit for MDNR review and approval a Report of Areas 2 and 3 Characterization and Treatability Investigation describing work performed according to the MDNR approved Work Plan for Areas 2 and 3 Characterization and Treatability Investigation Work Plan, in accordance with the schedule for submittal contained therein, including any necessary changes to the Site’s groundwater monitoring program so as to assure protection of human health and the environment.
6. Pilot Program Work Plan for Areas 2 and 3 – MRAC shall also submit for MDNR review and approval a Pilot Program Work Plan for Areas 2 and 3 (“Area 2 and Area 3 Pilot Program Work Plan”) within 30 days of MDNR approval of the Report of Areas 2 and 3 Characterization and Treatability Investigation. The Area 2 and Area 3 Pilot Program Work Plan shall include any necessary changes to the Site’s groundwater monitoring program so as to assure protection of human health and the environment. Upon receipt of MDNR’s written approval, MRAC shall implement the Area 2 and 3 Pilot Program Work Plan according to the schedule contained therein.

7. Pilot Program Assessment Report for Areas 2 and 3 –MRAC shall submit for MDNR review and approval a Pilot Program Report for Areas 2 and 3 describing work performed according to the MDNR approved Pilot Program Work Plan for Areas 2 and 3, in accordance with the schedule for submittal contained therein, including any necessary changes to the Site's groundwater monitoring program so as to assure protection of human health and the environment.

8. Focused Feasibility Study Work Plan – Within 60 days of approval of the Area 2/3 Report, MRAC shall submit a Focused Feasibility Study Work Plan ("FFS Work Plan") for the Site. The FFS Work Plan will describe activities required for MRAC to complete the FFS including any necessary changes to the Site's groundwater monitoring program so as to assure protection of human health and the environment and additional pilot testing, as warranted. Upon receipt of MDNR's written approval, MRAC shall implement the Focused Feasibility Study Work Plan according to the schedule contained therein.

9. Focused Feasibility Study Report –MRAC shall submit for MDNR review and approval a Focused Feasibility Study Report ("FFS Report") including an updated conceptual site model and human health and ecological risk assessments, which evaluates a range of remedial action alternatives for the Site, in accordance with the schedule for submittal contained within the MDNR approved FFS Work Plan. The FFS Report shall address Areas 1, 2, 3, and any other source areas discovered during the work requiring further remedial action, including soil and bedrock, shall address groundwater contamination requiring further remedial action, and shall:

- a. conform to all applicable EPA and MDNR guidance documents, unless MDNR approves of any substantive deviation based on persuasive justification provided by MRAC for such deviation;
- b. describe changes in Site conditions, including any source reduction resulting from completion of the Work;
- c. evaluate Site risks to human health and the environment following completion of the Work, as well as changes from Site conditions at the time of entry of the Consent Decree according to EPA FFS guidance, "*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, October 1988, EPA/540/G-89/004, OSWER Directive 9355.3-01" and risk assessment guidance, "*Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual*, December 1989, EPA/540/1-89/002."
- d. describe remedial action alternatives determined by MRAC and/or MDNR to be viable for evaluation in the FFS to address conditions at the Site, including but not limited to monitored natural attenuation and pump and treatment remedial actions, using "*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, October 1988, EPA/540/G-89/004, OSWER Directive 9355.3-01."

10. Contingency Response Actions – If MDNR determines continuation of the Work may cause endangerment to human health or the environment, MDNR may issue a written notice to MRAC specifying the grounds upon which such notice was issued and require MRAC to submit to MDNR within 30 days, or such other reasonable time determined by MDNR, a “Contingency Response Action Work Plan” determined through agreement of MRAC and MDNR, after consultation with EPA needed to protect human health and the environment.

11. MDNR’s Reservation of Rights – If: (1) MRAC fails to materially and substantially comply with the terms of this Agreement by, including but not limited to MRAC ceasing implementation of any portion of the Work or is seriously or repeatedly deficient or late in its performance of the Work; or (2) MDNR and MRAC fail to agree on a Contingency Response Action Work Plan within 30 days or such other reasonable time determined by MDNR, then MDNR may by written notice unilaterally terminate this Agreement, modify or no longer recognize any further excusable delay from the recognized December 2011 FM/ED Event, and seek all remedies available under the Consent Decree, including but not limited to invocation of Paragraph 38 regarding additional response activities and Paragraph 62 concerning endangerment and future response. In particular, MDNR reserves its rights, consistent with Paragraph 63, to take such actions as necessary to protect human health and the environment including implementation and restoration of the remedy set forth in the Record of Decision dated September 27, 1989, or the Consent Decree and attached Statement of Work.

12. Consent Decree Applicability – Except as set forth herein, all terms and conditions of the Consent Decree not inconsistent with this Agreement shall remain in effect, including but not limited to: Reporting Requirements (Section XII); Submissions Requiring Agency Approval (Section XIII), Endangerment and Future Response (Section XVII); Reimbursement of Response Costs (Section XVIII); Force Majeure/Excusable Delay (Section XX); Dispute Resolution (XXI); and Covenants Not to Sue (Section XXIII). In particular, MRAC agrees that this Agreement and performance of the Work under it shall be considered a “term and condition” subject to Stipulated Penalties under Paragraph 91 of the Consent Decree. Further, MRAC agrees to waive written notification as provided in Paragraph 91 of the Consent Decree for failure to timely submit documentation or perform required Work established in this Agreement.

13. Consent Decree Enforcement – MDNR agrees to forbear enforcement of the performance standards contained in the Consent Decree and the Statement of Work, including but not limited to, Paragraph 31 of the Consent Decree and Sections 3 and 5 of the Statement of Work, as of the December 2011 FM/ED Event, and lasting until the later of: (1) the completion date of any approved and in-effect Focused Feasibility Study Report, or (2) any other corrective measures implemented under this Agreement. In no case shall forbearance under this Agreement last beyond the date of any termination of this Agreement. MDNR has conferred with the EPA (also an original signatory to the Consent Decree), and EPA concurs with the terms and conditions of this Agreement, and EPA acknowledges MDNR as the lead agency for the Site regarding implementation of this Agreement and compliance with the Consent Decree.

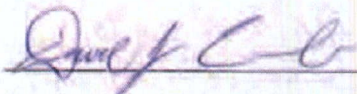
14. Termination – This Agreement shall terminate upon MRAC’s receipt of MDNR’s written approval of the FFS Report, which shall be on or before December 8, 2014, unless modified by mutual written agreement of the Parties. In the event MDNR unilaterally terminates

this Agreement pursuant to Paragraph 11, the time period associated with the December 2011 FM/ED Event and this Agreement shall not be subject to stipulated penalties in any future enforcement of the Consent Decree.

15. Modification – This Agreement may be modified by mutual written agreement of the Parties.

Missouri Department of Natural Resources


MRAC Inc.



Name: David J. Lamb

Title: Director- Hazardous Waste Program

Date: 6-15-2012



Name: Stephen L. Oberkrom

Title: Remediation Manager

Date: 6/8/2012

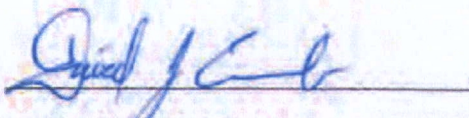
**FIRST MODIFICATION OF
AGREEMENT FOR ADDITIONAL REASONABLY NECESSARY TIME
REGARDING FORCE MAJEURE/EXCUSABLE DELAY**

This Agreement ("Agreement"), effective December 8, 2014, is entered into between MRAC, Inc. ("MRAC"), formerly known as Solid State Circuits, Inc. and the Missouri Department of Natural Resources ("MDNR")(collectively referred to herein as the "Parties").

The Parties hereby agree to an extension of the Agreement for Additional Reasonably Necessary Time Regarding Force Majeure/Excusable Delay, dated June 15, 2012, which is incorporated herein by reference, until February 6, 2015.

Missouri Department of Natural Resources

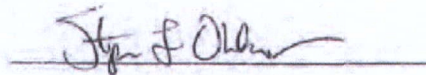
MRAC, Inc.



Name: David J. Lamb

Title: Director, Hazardous Waste Program

Date: 12-19-2014



Name: Stephen L. Oberkrom

Title: Remediation Manager

Date: 12/16/14

**SECOND MODIFICATION OF
AGREEMENT FOR ADDITIONAL REASONABLY NECESSARY TIME
REGARDING FORCE MAJEURE/EXCUSABLE DELAY**

This Agreement ("Agreement" or "Second Modified Agreement") is entered into and effective as of February 5, 2015, between MRAC, Inc. ("MRAC"), formerly known as Solid State Circuits, Inc. and the Missouri Department of Natural Resources ("Department") (collectively referred to herein as the "Parties").

RECITALS

WHEREAS, on September 27, 1989, a Record of Decision ("ROD") was finalized for the Site specifying the Superfund remedial action to be implemented at the Solid State Circuits Site ("Site") in Republic, Missouri;

WHEREAS, on July 2, 1990, Solid States Circuits, Inc. entered into a Consent Decree (U.S. Dist. Ct., W.D. Mo. Case No. 90-cv-3545) with the Department and the U.S. Environmental Protection Agency ("EPA") (hereinafter collectively "the Agencies") regarding the Site, specifying remedial actions to be undertaken at the Site including groundwater extraction and treatment;

WHEREAS, the Department is the "lead agency" for the Site, and the EPA is the "support agency" for the Site as those terms are defined in 40 CFR 300.5;

WHEREAS, the Statement of Work ("SOW") (Appendix 2 to the Consent Decree) specified those activities determined to be appropriate and sufficient by the Department, the EPA, and SSC to effectively implement the selected remedy and required MRAC to implement and maintain an air stripper treatment system to achieve specific performance standards in Section 5 of the SOW that are protective of human health and the environment;

WHEREAS, on December 8, 2011, a fire destroyed the air stripper treatment system and associated equipment and building that were in operation at the Site since 1991 as part of the remedial action implemented according to the Consent Decree and ROD for the Site;

WHEREAS, on December 8, 2011, MRAC notified the Agencies by phone and in writing of the destruction of the treatment system and provided official notice of a "Force Majeure/Excusable Delay" event pursuant to Section XX of the Consent Decree, which the Department recognized on December 29, 2011 (hereinafter "the December 2011 FM/ED Event");

WHEREAS, on June 15, 2012, an agreement was made pursuant to Paragraph 73 of the Consent Decree ("Original FM/ED Agreement") which documented and set forth the terms and conditions for a reasonably necessary extension of time for performance of the obligations and/or subsequent obligations affected by the December 2011 FM/ED Event and for MRAC to conduct additional remedial actions pursuant to this agreement so as to protect human health and the environment at the Site;

WHEREAS, effective December 8, 2014, the Parties entered into a First Modification of the FM/ED Agreement for the purpose of extending the termination period from December 8, 2014, until February 6, 2015, ("First Modified FM/ED Agreement");

WHEREAS, the Work under the Original FM/ED Agreement and First Modified FM/ED Agreement has not been completed despite good faith efforts and additional time is needed to complete the Work under those agreements;

WHEREAS, this Second Modified Agreement is made pursuant to Paragraph 73 of the Consent Decree and paragraph 15 of the Original FM/ED Agreement to document and set forth the revised terms and conditions for a reasonably necessary extension of time for performance of the obligations and/or subsequent obligations affected by the December 2011 FM/ED Event and for MRAC to conduct additional remedial actions pursuant to this Agreement so as to protect human health and the environment at the Site;

NOW THEREFORE, in consideration of the foregoing and the mutual promises and covenants contained herein, the sufficiency of which is hereby acknowledged and subject to modification according to this Agreement, the Parties agree that the Original FM/ED Agreement and First Modified FM/ED Agreement are hereby revoked and replaced with this Agreement as follows:

TERMS & CONDITIONS

1. Definitions – The term "Work" as used in this Agreement means only the Work under this Agreement and does not mean the term "Work" as defined in the Consent Decree.

2. Pilot Program Work Plan for Area 1 – On June 13, 2012, the Agencies approved the "Pilot Program Work Plan for In-Situ Soil Blending Treatment for Area 1" ("Area 1 Pilot Program Work Plan") that MRAC had submitted. The Area 1 Pilot Program Work Plan included any necessary changes to the Site's groundwater monitoring program so as to assure protection of human health and the environment. Upon receipt of the Department's written approval, MRAC began performance of work in the Area 1 Pilot Program Work Plan according to the schedule contained therein.

3. Pilot Program for In-Situ Soil Blending Treatment Report for Area 1 – On January 22, 2015, MRAC submitted to the Agencies for review and approval the "Pilot Program for In-Situ Soil Blending Treatment, Final Report" for Area 1 describing the work performed according to the Department approved Area 1 Pilot Program Work Plan, in accordance with the schedule for submittal contained therein, including any necessary changes to the Site's groundwater monitoring program so as to assure protection of human health and the environment.

4. Supplemental Work Plan for Areas 2 and 3 Characterization and Treatability Investigation Work Plan – On October 6, 2014, the Agencies approved the "Supplemental Work Plan for Areas 2 and 3, Characterization and Treatability Investigation (Revised) that MRAC had submitted. The Supplemental Work Plan for Areas 2 and 3, Characterization and Treatability Investigation (Revised) describes the sampling and analyses and other work needed to fully characterize the quantities and extent of contamination in Areas 2 and 3, and for evaluation of soil cleanup alternatives. The Supplemental Work Plan for Areas 2 and 3, Characterization and Treatability Investigation (Revised) included any necessary changes to the Site's groundwater

monitoring program so as to assure protection of human health and the environment. Upon receipt of Department's written approval, MRAC began the performance of work under the Supplemental Work Plan for Areas 2 and 3 Characterization and Treatability Investigation (Revised) according to the Target Schedule for FM/ED Agreement Completion, as attached to this Agreement and incorporated by reference herein.

5. Supplemental Areas 2 and 3 Characterization and Treatability Investigation Report/Areas 2 and 3 Pilot Program Work Plan – Consistent with the Target Schedule for FM/ED Agreement Completion, within 60 days (May 2015) of completion of work performed under the Supplemental Work Plan for Areas 2 and 3 Characterization and Treatability Investigation (Revised), MRAC shall schedule a pre-submittal meeting with the Agencies to present the investigation findings and propose pilot project work based on those findings. As agreed upon by the Parties at the pre-submittal meeting in May 2015, MRAC shall submit within 30 days (June 2015) of the meeting to the Agencies for review and approval the Supplemental Areas 2 and 3 Characterization and Treatability Investigation Report and Areas 2 and 3 Pilot Program Work Plan. The Supplemental Areas 2 and 3 Characterization and Treatability Investigation Report shall describe work performed according to the Department's approved October 2014 Supplemental Work Plan for Areas 2 and 3 Characterization and Treatability Investigation (Revised), including any necessary changes to the Site's groundwater monitoring program so as to assure protection of human health and the environment. The Area 2 and 3 Pilot Program Work Plan shall include any necessary changes to the Site's groundwater monitoring program so as to assure protection of human health and the environment. Upon receipt of the Department's written approval, MRAC shall implement the Areas 2 and 3 Pilot Program Work Plan according to the Target Schedule for FM/ED Agreement Completion.

6. Areas 2 and 3 Pilot Program Assessment and Report – Consistent with Target Schedule for FM/ED Agreement Completion, within 270 days of the Agencies review and approval of the Areas 2 and 3 Pilot Program Work Plan (May 2016) MRAC shall submit for the Agencies review and approval the Areas 2 and 3 Pilot Program Assessment and Report describing work performed according to the Department's approved Areas 2 and 3 Pilot Program Work Plan, in accordance with the schedule for submittal contained therein, including any necessary changes to the Site's groundwater monitoring program so as to assure protection of human health and the environment. The Agencies shall review and approve the Areas 2 and 3 Pilot Program Assessment and Report within 60 days (July 2016).

7. Focused Feasibility Study Work Plan – Consistent with Target Schedule for FM/ED Agreement Completion, within 60 days of approval of the Areas 2 and 3 Pilot Program Assessment and Report (September 2016), MRAC shall submit a Focused Feasibility Study ("FFS") Work Plan for the Site. The FFS Work Plan will describe activities required for MRAC to complete the FFS including any necessary changes to the Site's groundwater monitoring program so as to assure protection of human health and the environment and additional pilot testing, as warranted. The Agencies shall review and approve the FFS Work Plan within 90 days. Upon receipt of Department's written approval (December 2016), MRAC shall implement the FFS Work Plan according to the Target Schedule for FM/ED Agreement Completion.

8. Focused Feasibility Study Report – Consistent with Target Schedule for FM/ED Agreement Completion, within 135 days of the Agencies' approval of the FFS Work Plan (May

2017), MRAC shall submit to the Agencies for review and approval a FFS Report including an updated conceptual site model and human health and ecological risk assessments, which evaluates a range of remedial action alternatives for the Site, in accordance with the schedule for submittal contained within the Department approved FFS Work Plan. The FFS Report shall address Areas 1, 2, 3, and any other source areas discovered during the work requiring further remedial action, including soil and bedrock, shall address groundwater contamination requiring further remedial action, and shall:

- a. conform to all applicable Agency guidance documents, unless the Department approves of any substantive deviation based on persuasive justification provided by MRAC for such deviation;
- b. describe changes in Site conditions, including any source reduction resulting from the completion of all previous Areas 1, 2 and 3 and any other source areas Work;
- c. evaluate Site risks to human health and the environment following completion of all previous Areas 1, 2 and 3 and any other source areas Work, as well as changes from Site conditions at the time of entry of the Consent Decree according to EPA FFS guidance, "*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, October 1988, EPA/540/G-89/004, OSWER Directive 9355.3-01" and risk assessment guidance, "*Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual*, December 1989, EPA/540/1-89/002;"
- d. describe remedial action alternatives determined by MRAC and/or the Agencies to be viable for evaluation in the FFS to address conditions at the Site, including but not limited to monitored natural attenuation and pump and treatment remedial actions, using "*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, October 1988, EPA/540/G-89/004, OSWER Directive 9355.3-01."

9. Contingency Response Actions – If the Department determines continuation of the Work may cause endangerment to human health or the environment, the Department may issue a written notice to MRAC specifying the grounds upon which such notice was issued and require MRAC to submit to the Department within 30 days, or such other reasonable time determined by the Department, a "Contingency Response Action Work Plan" determined through agreement of MRAC and the Department, after consultation with the EPA needed to protect human health and the environment.

10. Department's Reservation of Rights – If: (1) MRAC fails to materially and substantially comply with the terms of this Agreement by, including but not limited to MRAC ceasing implementation of any portion of the Work or is seriously or repeatedly deficient or late in its performance of the Work; or (2) the Department and MRAC fail to agree on a Contingency Response Action Work Plan within 30 days or such other reasonable time determined by the Department, then the Department may by written notice unilaterally terminate this Agreement,

modify or no longer recognize any further excusable delay from the recognized December 2011 FM/ED Event, and seek all remedies available under the Consent Decree, including but not limited to invocation of Paragraph 38 regarding additional response activities and Paragraph 62 concerning endangerment and future response. In particular, the Department reserves its rights, consistent with Paragraph 63, to take such actions as necessary to protect human health and the environment including implementation and restoration of the remedy set forth in the Record of Decision dated September 27, 1989, or the Consent Decree and attached Statement of Work.

11. Consent Decree Applicability – Except as set forth herein, all terms and conditions of the Consent Decree not inconsistent with this Agreement shall remain in effect, including but not limited to: Reporting Requirements (Section XII); Submissions Requiring Agency Approval (Section XIII), Endangerment and Future Response (Section XVII); Reimbursement of Response Costs (Section XVIII); Force Majeure/Excusable Delay (Section XX); Dispute Resolution (XXI); and Covenants Not to Sue (Section XXIII). In particular, MRAC agrees that this Agreement and performance of the Work under it shall be considered a “term and condition” subject to Stipulated Penalties under Paragraph 91 of the Consent Decree. Further, MRAC agrees to waive written notification as provided in Paragraph 91 of the Consent Decree for failure to timely submit documentation or perform required Work established in this Agreement.

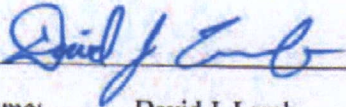
12. Consent Decree Enforcement – the Department agrees to forbear enforcement of the performance standards contained in the Consent Decree and the Statement of Work, including but not limited to, Paragraph 31 of the Consent Decree and Sections 3 and 5 of the Statement of Work, as of the December 2011 FM/ED Event, and lasting until the later of: (1) the completion date of any approved and in-effect FFS Report, or (2) any other corrective measures implemented under this Agreement. In no case shall forbearance under this Agreement last beyond the date of any termination of this Agreement. The Department has conferred with the EPA (also an original signatory to the Consent Decree), and EPA concurs with the terms and conditions of this Agreement, and the EPA acknowledges the Department as the lead agency for the Site regarding implementation of this Agreement and compliance with the Consent Decree.

13. Termination – This Agreement shall terminate upon MRAC’s receipt of the Department’s written approval of the FFS Report, which shall be on or before August 2017 (90 days following the FFS Report submission date of May 2017), unless modified by mutual written agreement of the Parties. In the event the Department unilaterally terminates this Agreement pursuant to Paragraph 12, the time period associated with the December 2011 FM/ED Event and this Agreement shall not be subject to stipulated penalties in any future enforcement of the Consent Decree.

14. Modification – This Agreement may be modified by mutual written agreement of the Parties.

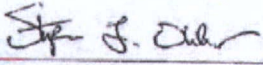
Missouri Department of Natural Resources

MRAC Inc.


Name: David J. Lamb

Title: Director - Hazardous Waste Program

Date: 3/13/2015


Name: Stephen L. Oberkrom

Title: Remediation Manager

Date: 3/9/2015

ATTACHMENT TO SECOND MODIFICATION OF
 AGREEMENT FOR ADDITIONAL REASONABLY NECESSARY TIME
 REGARDING FORCE MAJEURE/EXCUSABLE DELAY
 EFFECTIVE FEBRUARY 5, 2015

Target Schedule for FM/ED Agreement Completion
Solid State Circuits Superfund Site
Republic, MO

Task	Days	Month / Year
Areas 2/3 Field Work Completion		
Well installation	15	Feb / 2015
Well development & sampling	7	Mar / 2015
Lab analyses	15	Mar / 2015
Areas 2/3 Report/Pilot Work Plan		
Pre-Submittal Meeting	60	May / 2015
Areas 2/3 Report/Pilot Work Plan Submittal	30	Jun / 2015
Agencies Review/Approve Report/Pilot Work Plan	60	Aug / 2015
Pilot Program Assessment & Report for Areas 2/3	270	May / 2016
Agencies Review/Approve Report for Areas 2/3	60	Jul / 2016
Focused FS Work Plan	60	Sep / 2016
Agencies Review/Approve Focused FS Work Plan	90	Dec / 2016
Focused FS Report	135	May / 2017
Agencies Review/Approve Focused FS Report	90	Aug / 2017

Notes:

- Tasks with shadowing indicate Agency review periods.
- For Tasks where MRAC specified deliverables schedules, the company intends to submit documents on a faster timeframe when feasible.

Appendix D

**Five-Year Review Site Inspection
Checklist and Roster**

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Solid State Circuits	Date of inspection: 10/20/2016
Location and Region: Republic, MO; Region VII	EPA ID: MOD 980854111
Agency, office, or company leading the five-year review: Missouri MDNR/HWP/SPF	Weather/temperature: P. Cloudy, Cool (60°), Windy
Remedy Includes: (Check all that apply) <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input checked="" type="checkbox"/> Groundwater pump and treatment (until 12/08/2011 fire) <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u>On December 8, 2011, a fire totally destroyed the on-site treatment facility that housed and included the pump & treat equipment and the building. The site is currently operating under a Force Majeure/Excusable Delay Agreement, which has allowed the operation of ongoing pilot studies in soil impacted areas and to assist in determining the site's path forward for the site.</u> </div> <div style="width: 50%;"> <input type="checkbox"/> Monitored natural attenuation <input checked="" type="checkbox"/> Groundwater containment (unknown at this time) <input type="checkbox"/> Vertical barrier walls </div> </div>	
Attachments: <input checked="" type="checkbox"/> Inspection team roster attached <input checked="" type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Anthony Moore</u> <u>Senior Project Manager for EWI</u> <u>10/20/2016</u> <div style="display: flex; justify-content: space-between; font-size: small;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached <u>Pleased with progress of site remediation.</u>	
2. O&M staff <u>Anthony Moore</u> <u>Senior Project Manager for EWI</u> <u>10/20/2016</u> <div style="display: flex; justify-content: space-between; font-size: small;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached <u>Pleased with progress of site remediation.</u>	
3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. Agency <u>Republic's Public Works Department</u> Contact <u>Mr. David Brock</u> <u>Director</u> <u>10/20/2016</u> <u>417-732-3400</u> <u>In-Person Interview</u> <div style="display: flex; justify-content: space-between; font-size: small;"> Name Title Date Phone no. </div> Problems; suggestions; <input type="checkbox"/> Report attached <u>Happy to see more ongoing site related activities in the last few years.</u>	
4. Other interviews: None <input type="checkbox"/> Report attached.	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	O&M Documents <input checked="" type="checkbox"/> O&M manual <input checked="" type="checkbox"/> As-built drawings <input checked="" type="checkbox"/> Maintenance logs	<input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A
Remarks <u>There are no permanent buildings on-site since the 12/08/2011 fire. EWI has maintained copies of the O&M Plans, as-built drawings, maintenance logs and all other site-related documents and plans at their Springfield MO office and CD copies can be found at the local library.</u>			
2.	Site-Specific Health and Safety Plan <input checked="" type="checkbox"/> Contingency plan/emergency response plan	<input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> N/A
Remarks <u>There are no permanent buildings on-site since the 12/08/2011 fire. EWI has maintained copies of the HASP and Contingency/Emergency Response Plan at their Springfield MO office and CD copies can be found at the local library.</u>			
3.	O&M and OSHA Training Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> N/A
Remarks <u>There are no permanent buildings on-site since the 12/08/2011 fire. EWI has maintained copies of the O&M Plans and OSHA training records at their Springfield MO office.</u>			
4.	Permits and Service Agreements <input checked="" type="checkbox"/> Air discharge permit <input checked="" type="checkbox"/> Effluent discharge <input checked="" type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Other permits	<input type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
Remarks <u>There are no permanent buildings on-site since the 12/08/2011 fire. EWI has maintained copies of the Effluent Discharge and Waste Disposal Reports, the POTW (NPDES/MSOP permit) at their Springfield MO office and CD copies can be found at the local library.</u>			
5.	Gas Generation Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks			
6.	Settlement Monument Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks			
7.	Groundwater Monitoring Records	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A
Remarks <u>There are no permanent buildings on-site since the 12/08/2011 fire. EWI has maintained copies of the Groundwater Monitoring Records at their Springfield MO office and CD copies can be found at the local library.</u>			
8.	Leachate Extraction Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks			
9.	Discharge Compliance Records <input type="checkbox"/> Air <input checked="" type="checkbox"/> Water (effluent)	<input type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input type="checkbox"/> N/A
Remarks <u>There are no permanent buildings on-site since the 12/08/2011 fire. EWI has maintained copies of all site-related documents and plans at their Springfield MO office and CD copies can be found at the local library.</u>			
10.	Daily Access/Security Logs	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
Remarks <u>Both the walk-in and drive through gates are locked. The fence has barbed wire on top.</u>			

IV. O&M COSTS

1. **O&M Organization**

- ☐ State in-house ☐ Contractor for State
☒ PRP in-house ☒ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other _____

2. **O&M Cost Records**

- ☒ Readily available ☒ Up to date
☒ Funding mechanism/agreement in place
 Original O&M cost estimate was presented as an annual cost of \$445,300 per FS
☐ Breakdown attached

Total annual cost by year for review period if available

From <u>01/01/2012</u>	To <u>12/31/2012</u>	<u>\$722,000</u>	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From <u>01/01/2013</u>	To <u>12/31/2013</u>	<u>\$828,000</u>	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From <u>01/01/2014</u>	To <u>12/31/2014</u>	<u>\$444,000</u>	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From <u>01/01/2015</u>	To <u>12/31/2015</u>	<u>\$965,000</u>	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From <u>01/01/2016</u>	To <u>12/31/2016</u>	<u>\$319,000</u>	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From <u>01/01/2017</u>	To <u>03/31/2017</u>	<u>\$109,000</u>	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Since the December 8, 2011 on-site fire destroyed the main on-site building that housed the operational components of the pump & treat operation (chosen remedial action), the site's O&M Costs for this FYR period is based on pilot studies and monitoring. The ongoing pilot studies for Areas 1, 2 and 3 soils are being conducted under a Force Majeure/Excusable Delay Agreement. The pilot studies will determine whether the implemented remedial actions for the source soils are remediating the VOC contamination within the soils. Limited on-site and off-site groundwater and surface water monitoring is being conducted to verify the location of the site's contaminant plumes in the three hydrogeological zones and monitor the remediation of the source soils in Areas 1, 2 and 3. (See "Question A, Costs of System Operations/Operation & Maintenance for an additional explanation.")

V. ACCESS AND INSTITUTIONAL CONTROLS <input type="checkbox"/> Applicable <input type="checkbox"/> N/A			
A. Fencing			
1.	Fencing damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input checked="" type="checkbox"/> N/A	Remarks <u>No damage to the fence or gates were evident during the current site visit (10/20/2016).</u>	
B. Other Access Restrictions			
1.	Signs and other security measures <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A	Remarks <u>The SSC site is fenced and topped with strands of barbed wire. There is a walk-in gate and drive through gate that are always locked. There are signs on the fence on three sides. The fourth side sign is located on the drive through gate.</u>	
C. Institutional Controls (ICs)			
1.	Implementation and enforcement Site conditions imply ICs not properly implemented <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Site conditions imply ICs not being fully enforced <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Type of monitoring (e.g., self-reporting, drive by) <u>Self-reporting and Agency period split sampling.</u> Frequency <u>Quarterly, semi-annual, annual and every five-years.</u> Responsible party/agency <u>EWI for MRAC/MDNR/HWP</u> Contact <u>Anthony Moore,</u> <u>Senior Project Manager</u> <u>10/20/2016</u> <u>816-285-9500</u> <div style="display: flex; justify-content: space-between; margin-top: -10px;"> Name Title Date Phone no. </div> Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Reports are verified by the lead agency <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Other problems or suggestions: <input type="checkbox"/> Report attached <u>The write-up regarding ICs can be found in this FYR Report (II. Response Action Summary, IC Summary Table).</u> <hr/>		
2.	Adequacy <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A Remarks <u>The city of Republic instituted a City Ordinance within the city limits and the State of Missouri established a "Sensitive Area C" designation within Greene County. The Republic Ordinance prohibits the installation of new wells without prior approval by Republic and the SSC site Missouri Project Manager; and Missouri "Sensitive Area C" established the criteria for installing new wells.</u>		

D. General	
1.	Vandalism/trespassing <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident Remarks _____
2.	Land use changes on site <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Remarks <u>The December 8, 2011 fire temporarily changed the site's current land use by destroying the site's treatment facility that housed the pump & treat operational equipment in the main on-site building. Recent on-site activities included the on-site potential remediation of Area 1 source soils. Currently the only structures located on-site are one permanent large out building used as storage and a temporary Baker tank used to temporarily store collected purge and sampling water.</u>
3.	Land use changes off site <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Remarks <u>The day care (KidZone) facility just north and across Elm Street closed and went out-of-business sometime after the December 8, 2011 site fire.</u>
VI. GENERAL SITE CONDITIONS	
A. Roads <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks <u>Upon entering the site through the gate, there is a gravel driveway/parking area on the east side of the site that extends to the northern fence.</u>
B. Other Site Conditions <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
Remarks <u>There is one medium-sized permanent storage building and a Baker tank on-site. The building store a variety of supplies and the Baker tank temporarily stores collected purge and sampling water until it is sampled and properly disposed off-site. There is still a number on-site extraction and monitoring wells, including four new monitoring wells (SSC-150, SSC-155, SSC-156 and SSC-168). With the extreme weather conditions and other site changes, there are currently no trees; however, there is an adequate grass cover.</u>	

VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
A. Landfill Surface <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Widths _____ Depths _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Holes not evident
5.	Vegetative Cover <input type="checkbox"/> Grass <input type="checkbox"/> Cover properly established <input type="checkbox"/> No signs of stress <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____		
6.	Alternative Cover (armored rock, concrete, etc.) <input checked="" type="checkbox"/> N/A Remarks _____		
7.	Bulges Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<input type="checkbox"/> Bulges not evident
8.	Wet Areas/Water Damage <input type="checkbox"/> Wet areas/water damage not evident <input type="checkbox"/> Wet areas <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Ponding <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Seeps <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Soft subgrade <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____		
9.	Slope Instability <input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of slope instability Areal extent _____ Remarks _____		

B. Benches <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	Flows Bypass Bench Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
2.	Bench Breached Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
3.	Bench Overtopped Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
C. Letdown Channels <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	Settlement Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement
2.	Material Degradation Material type _____ Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation
3.	Erosion Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion
4.	Undercutting Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of undercutting
5.	Obstructions Type _____ <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____	<input type="checkbox"/> No obstructions
6.	Excessive Vegetative Growth Type _____ <input type="checkbox"/> No evidence of excessive growth <input type="checkbox"/> Vegetation in channels does not obstruct flow <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____	

D. Cover Penetrations <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Gas Vents	<input type="checkbox"/> Active <input type="checkbox"/> Passive	
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance
	<input type="checkbox"/> N/A		
	Remarks _____		
2.	Gas Monitoring Probes		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks _____		
3.	Monitoring Wells (within surface area of landfill)		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks _____		
4.	Leachate Extraction Wells		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks _____		
5.	Settlement Monuments	<input type="checkbox"/> Located	<input type="checkbox"/> Routinely surveyed <input type="checkbox"/> N/A
	Remarks _____		
E. Gas Collection and Treatment <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Gas Treatment Facilities		
	<input type="checkbox"/> Flaring	<input type="checkbox"/> Thermal destruction	<input type="checkbox"/> Collection for reuse
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	
	Remarks _____		
2.	Gas Collection Wells, Manifolds and Piping		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	
	Remarks _____		
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks _____		

F. Cover Drainage Layer		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Outlet Pipes Inspected Remarks _____	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
2.	Outlet Rock Inspected Remarks _____	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
G. Detention/Sedimentation Ponds		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Siltation Areal extent _____ Depth _____ <input type="checkbox"/> Siltation not evident Remarks _____		<input type="checkbox"/> N/A
2.	Erosion Areal extent _____ Depth _____ <input type="checkbox"/> Erosion not evident Remarks _____		
3.	Outlet Works Remarks _____	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
4.	Dam Remarks _____	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
H. Retaining Walls		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Deformations Horizontal displacement _____ Vertical displacement _____ Rotational displacement _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
2.	Degradation Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
I. Perimeter Ditches/Off-Site Discharge		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Siltation Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident
2.	Vegetative Growth <input type="checkbox"/> Vegetation does not impede flow Areal extent _____ Type _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A

3.	Erosion Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> Erosion not evident
4.	Discharge Structure Remarks _____ _____	<input type="checkbox"/> Functioning <input type="checkbox"/> N/A
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A		
1.	Settlement Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> Settlement not evident
2.	Performance Monitoring Type of monitoring _____ <input type="checkbox"/> Performance not monitored Frequency _____ <input type="checkbox"/> Evidence of breaching Head differential _____ Remarks _____ _____	

IX. GROUNDWATER/SURFACE WATER REMEDIES <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Pumps, Wellhead Plumbing, and Electrical <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells properly operating <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks <u>Shortly after the December 8, 2011 fire, the well pumps, wellhead plumbing and electrical lines at the wellheads were inspected and repaired as needed. Multiple sampling events since then have verified the operational status of the on-site and off-site extraction and monitoring wells.</u>
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks <u>The December 8, 2011 fire destroyed the main on-site building that housed all the operational equipment, including the extraction system pipelines, valves, valve boxes and other equipment.</u>
3.	Spare Parts and Equipment <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks <u>The consultant has maintained a good inventory of spare parts and equipment to keep the site-related extraction and monitoring wells operational.</u>
B. Surface Water Collection Structures, Pumps, and Pipelines <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Collection Structures, Pumps, and Electrical <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks <u>Roberts Spring is manually sampled using a sampling cup on an extension pole.</u>
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks _____ _____
3.	Spare Parts and Equipment <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks <u>Replacement sampling cups and extension poles are readily available.</u>

C. Treatment System		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A (Due to the December 8, 2011 on-site fire.)
1.	Treatment Train (Check components that apply) <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers <input type="checkbox"/> Filters _____ <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____ <input type="checkbox"/> Others _____ <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> Sampling ports properly marked and functional <input type="checkbox"/> Sampling/maintenance log displayed and up to date <input type="checkbox"/> Equipment properly identified <input type="checkbox"/> Quantity of groundwater treated annually _____ <input type="checkbox"/> Quantity of surface water treated annually _____ Remarks _____		
2.	Electrical Enclosures and Panels (properly rated and functional) <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____		
3.	Tanks, Vaults, Storage Vessels <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance Remarks _____		
4.	Discharge Structure and Appurtenances <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____		
5.	Treatment Building(s) <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input type="checkbox"/> Chemicals and equipment properly stored Remarks _____		
6.	Monitoring Wells (pump and treatment remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks <u>On-site and off-site monitoring wells are sampled on a regular basis as outlined in the QAPP and SAP relating to the Force Majeure/Excusable Delay Agreement.</u>		
D. Monitoring Data			
1.	Monitoring Data <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality Remarks <u>Overall, the monitoring data supplied by the consultant has been routinely submitted on time and is of acceptable quality; however, some comments and observations within the sampling reports have been lacking.</u>		
2.	Monitoring data suggests: <input type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining Remarks <u>Due to the December 8, 2011 fire, the EPA changed the status of the "Groundwater Under Control Environmental Indicator" for the SSC site to "Not Under Control effective January 27, 2012. This FYR Report will determine whether the status can be upgraded.</u>		

D. Monitored Natural Attenuation			
1.	Monitoring Wells (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks		
X. OTHER REMEDIES			
<p>If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.</p> <p><u>Under the Force Majeure/Excusable Delay Agreement the RP's consultant has implemented a pilot project for Area 1 and Areas 2 and 3. The "Pilot Project Work Plan for Area 1" was approved by the Agencies on June 13, 2012. The Area 1 Pilot Project was implemented in December 2012 and consisted of blending ISCO into the Area 1 source soils. The "Pilot Project Work Plan for Areas 2 and 3" was approved by the Agencies on August 27, 2015. The Areas 2 and 3 Pilot Project was implemented in October 2015 and consisted of multiple injections of different products into the Areas 2 and 3 source soils at different depths.</u></p>			
XI. OVERALL OBSERVATIONS			
A. Implementation of the Remedy			
<p>Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).</p> <p><u>The RAO goals of the SSC site remedial action were to contain and remediate the VOC contamination in the three groundwater aquifers and to restore the three aquifers to "any use" conditions through the implementation of the on-site pump and treat operation. Until the December 8, 2011 on-site fire, groundwater sampling and monitoring determined that the remedial action was achieving VOC contaminant containment, was achieving limited removal success and was slowly restoring the three groundwater aquifers. The destruction of the on-site pump & treat operation changed the operational component of the remedy and thus may impact the site. Under a Force Majeure/Excusable Delay Agreement, the three newly rediscovered source soils in Areas 1, 2 and 3 are undergoing potential remediation under Pilot Studies. Due to the current operational uncertainties, the EPA changed the status of the "Groundwater Under Control Environmental Indicator" for the SSC site to "Not Under Control" effective January 27, 2012.</u></p>			
B. Adequacy of O&M			
<p>Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.</p> <p><u>The site is experiencing current operational uncertainties due to the December 8, 2011 on-site fire that destroyed the pump and treat operational component of the remedial action. The EPA changed the status of the "Groundwater Under Control Environmental Indicator" for the site to "Not Under Control" effective January 27, 2012.</u></p>			

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

The remedial outcomes of the three soil source areas (Areas 1 and 2/3) could potentially impact the SSC site's ability to achieve the RAOs for groundwater and the protectiveness of the remedy.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Under the Force Majeure/Excusable Delay Agreement the RP's consultant has implemented Pilot Projects for Areas 1, 2 and 3. The "Pilot Project Work Plan for Area 1" was approved by the Agencies on June 13, 2012. The Area 1 Pilot Project was implemented in December 2012 and consisted of blending ISCO into the Area 1 source soils. The "Pilot Project Work Plan for Areas 2 and 3" was approved by the Agencies on August 27, 2015. The Areas 2 and 3 Pilot Project was implemented in October 2015 and consisted of multiple injections of different products into the Areas 2 and 3 source soils at different depths.

Site Inspection Team Roster		
Personnel	Representing	Phone Number
Candice McGhee	MDNR/HWP	573-751-1738
Laura Price	EPA Region VII	913-551-7130
Jessica Kidwell	EPA Region VII	913-551-9064
Steve Oberkrom	Nokia EH&S	816-434-0210
Anthony Moore	EWI	417-890-9500
David Brock, Director	Republic's Public Works Department	417-732-3400

Appendix E
Site Photographs



Photograph 1

Photo taken 04/04/2016, Candice McGhee, DEQ, HWP, SF

Photo of southern portion of property and remaining building outside fenced area, facing south.



Photograph 2

Photo taken 04/04/2016, Candice McGhee, DEQ, HWP, SF

Photo of downed tree, debris and back of remaining building outside the fenced area, facing southeast.



Photograph 3

Photo taken 04/04/2016, Candice McGhee, DEQ, HWP, SF
Photo of fence and site beyond with warehouses across the street, facing west. 1 of 2.



Photograph 4

Photo taken 04/02/2015, Candice McGhee, DEQ, HWP, SF
Photo of fence and site beyond with abandoned daycare (KidZone) in background across the street, facing northwest. 2 of 2.



Photograph 5

Photo taken 04/04/2016, Candice McGhee, DEQ, HWP, SF
Photo of grassy area inside and outside fenced area, facing northeast.



Photograph 1

Photo taken by Candice McGhee, DEQ, HWP, SF

Photo of southern portion of SSC site within fenced area (Area 1) and remaining building outside fenced area, facing southwest. 1 of 4.



Photograph 2

Photo taken by Candice McGhee, DEQ, HWP, SF

Photo of SSC site within fenced area (Area 1) post construction of four new on-site monitoring wells, facing west. 2 of 4.



Photograph 3

Photo taken by Candice McGhee, DEQ, HWP, SF
Photo of SSC site within fenced area (Area 1), facing northwest. The daycare (Kidzone), north of the site and across the street, has been closed and abandoned for many years. 3 of 4.



Photograph 4

Photo taken by Candice McGhee, DEQ, HWP, SF
Photo of SSC site within fenced area (Area 1), facing north. 4 of 4.



Photograph 5

Photo taken by Candice McGhee, DEQ,
HWP, SF

Photo of open SBR monitoring well
SSC-3A showing tubing associated with
Waterloo® sampling system.



Photograph 6

Photo taken by Candice McGhee, DEQ, HWP, SF
Photo of creek from Roberts Spring, facing north. 1 of 3.



Photograph 7

Photo taken by Candice McGhee, DEQ, HWP, SF
Photo of creek from Roberts Spring, facing northwest. 2 of 3.



Photograph 8

Photo taken by Candice McGhee, DEQ, HWP, SF
Photo of Roberts Spring showing discharge locations from hillside, facing northwest.

Appendix F
Public Notices

Missouri owes a big debt to politician John Scott

You probably have never heard of John Scott. I hadn't. Yet, he was instrumental in the formation of our state and its public education system. He was also, as any resident of the new Show-Me state should be, something of a character.

John Scott was born in Virginia sometime in 1782. His father had come from Scotland and was a weaver and tailor by trade. John had one brother, Andrew Scott, Jr.

In 1802, Andrew, Sr. moved his family to the Indiana Territory where they settled at Vincennes. Then the family traveled by boat on the Wabash, Ohio and Mississippi Rivers until they reached the oldest town in Missouri—St. Genevieve.

John returned east to attend Princeton College where he graduated in 1805. Returning to Indiana, he worked as a school teacher while studying the law. He was admitted to the bar in 1806 and set up the first law office in St. Genevieve.

When the war of 1812 began, John signed up for military service and was given the rank of captain. He was also appointed that year to the Missouri Territory's first territorial legislature.

After returning from the war, John was an unusual sight as he practiced law. He always carried a green bag, which was a tradition that came over from England, but which was not followed much in the States after the Revolution.

His dress was for comfort,

instead of style. He wore pantaloons that were much too large for him so they would be roomy and cinched them at the waist with a belt. He also always donned a black cloth cap before going outside.

Since John had to travel by horseback from court to court when working his circuit, he always carried a pistol (along dagger) strapped to the other. He was very proficient with either.

This can be verified by the fact that he once became incensed at a newspaper article he read at the breakfast table and challenged five men to a duel before he even finished his meal. All five refused to duel him.

John's first wife, whom he had married in 1810, died in 1815 and their daughter died the next year at the age of 5. John became the first U.S. Attorney for the Missouri Territory and in 1816 he ran for territorial congressional delegate. Although he won by 15 votes, his opponent contested the close race and said John had committed fraud during the election.

John traveled—by horseback—from Missouri to Washington, D.C. to argue his side of the election. The U.S. Senate declared the election void in January of 1817 and decided that there should be a new election held in August of that year. Upon his return to Missouri, John spent the next seven months campaigning and this time he won by 392 votes.

Popular in the Missouri

Territory, John became a member of the House of Representatives in December of 1817.

In December of 1819, John traveled once again to Washington, D.C., to present a petition to Congress for Missouri to be admitted as a state. John and his fellow politicians drew up a constitution and John, who was well-educated from his years at Princeton and an avid believer in the power of education, wrote the portions establishing a state university and allowing for free public schools.

During this period, John became good friends with fellow Missouri politician Thomas Hart Benton, who would later serve three decades as a U.S. Senator from Missouri, and General Henry Dodge, who served as sheriff of St. Genevieve County and fought in the War of 1812, the Black Hawk War and was an Indian fighter for the Army in the West. He was also friends with and the attorney for Missourian John Smith "T", who was a fierce fighter and killed at least seven men in duels.

Returning to Washington, D.C., in November of 1820, John carried the new Missouri constitution in his saddlebags to present to the Congress. Eight months later, Congress admitted Missouri to statehood on August 10, 1821. John then was elected to the Congress as a U.S. Representative from the new state of Missouri.

1824 was a momentous year for John. He married again, and he also cast his

Missouri vote for John Quincy Adams for President.

The electoral vote that year was so close that the election went to the House, with each state having one vote. John Scott was Missouri's lone representative. Although the majority of Missourians favored Andrew Jackson, John cast the Missouri vote—and the deciding vote as it turned out—for John Quincy Adams.

His former friend, Thomas Hart Benton, had a falling out with John and they remained enemies for the remainder of their lives.

The people back home were also incensed by his vote for Adams, so much so that in the next election in 1826 they voted John out. He completed his term in early 1827 and never ran for political office again.



Many reasons were offered by his adversaries for his vote for Adams, including a deal to get his brother off on dueling charges and financial incentives offered by the Adams camp. John himself said he voted for Adams because he didn't think a military man such as Jackson should be president at that time.

Twenty years after his vote for Adams, John was still defending it in a letter to the editor that was run in the

Boon's Lick Times in Fayette, Missouri on November 16, 1844.

John's second wife died in 1835. He remained a practicing lawyer in St. Genevieve until his death in 1861 at the age of 76.

During John Scott's political career he was a big factor in bringing statehood to Missouri. And during his day he was sometimes dubbed the "Father of Missouri Education."



John Scott of St. Genevieve helped bring Missouri to statehood and had a number of "firsts" during his career. John's tombstone after his death in St. Genevieve at the age of 79.

City of Willard, MO Summary of Revenues, Expenditures, and Transfers For the Six Months Ending June 30, 2016				
	Revenues & Transfers	Expenditures & Transfers	Long Term Debt	Balance
General Fund	\$1,003,734.67	\$1,003,734.67	\$0.00	\$0.00
Police, Park & Street	\$1,003,734.67	\$1,003,734.67	\$0.00	\$0.00
Water & Sewer Fund	\$1,003,734.67	\$1,003,734.67	\$0.00	\$0.00
TOTAL	\$1,003,734.67	\$1,003,734.67	\$0.00	\$0.00
Long Term Debt				
CDP Wells (2015)	\$1,003,734.67	\$1,003,734.67	\$0.00	\$0.00
Water Sewer (2015)	\$1,003,734.67	\$1,003,734.67	\$0.00	\$0.00
1996 REVENUE BONDS	\$1,003,734.67	\$1,003,734.67	\$0.00	\$0.00
TOTAL	\$1,003,734.67	\$1,003,734.67	\$0.00	\$0.00

U.S. Environmental Protection Agency Region 7
begins the Fifth Five-Year Review for the
Solid State Circuits, Inc., Superfund Site
Republic, Greene County, Missouri

The U.S. Environmental Protection Agency has started the fifth five-year review for the Solid State Circuits, Inc., Superfund Site. The review is required by the Superfund law to make sure completed cleanups continue to protect human health and the environment. This five-year review should be completed by September 2017.

The EPA encourages community members to ask questions and report any concerns about this site. A final report will be prepared at the end of the review.

The EPA has assessed the ability of the local public to access the five-year review through an internet-based repository and has determined that the local community has this ability. As a result, the fifth five-year review for this site will be available through an internet site once completed.

Questions or requests for site information and/or the five-year-review process can be submitted to:

Pamela Houston
U.S. EPA Community Engagement Specialist
Toll free: 800-223-0425
Email: houston.pamela@epa.gov

Additional site information and previous five-year reviews are available at the following website:
<https://www.epa.gov/supercleanupsites/csiinfo.cfm?id=0701392>

CITY OF ASH GROVE, MISSOURI SUMMARY OF REVENUES, EXPENDITURES AND TRANSFERS FOR THE YEAR ENDING JUNE 30, 2016				
	FUND BALANCE January 1, 2016	REVENUES	EXPENDITURES	FUND BALANCE June 30, 2016
GENERAL FUND (Police, Park & Street)	\$ 1,003,734.67	\$ 642,724.89	\$ 795,826.13	\$ 849,633.43
WATER & SEWER FUND	\$ 2,419,182.11	\$ 411,138.50	\$ 315,778.13	\$ 2,514,542.48
TOTAL	\$ 3,422,916.78	\$ 1,053,863.39	\$ 1,111,604.26	\$ 3,365,175.91
LONG TERM DEBT				
	Debt Outstanding January 1, 2016	Issued	Retired	Debt Outstanding June 30, 2016
USDA (2015)	\$ 2,400,000.00	\$	\$ 2,400.00	\$ 2,397,599.71
2006 CDP WELL (2015)	\$ 90,000.00	\$	\$ 15,000.00	\$ 75,000.00
WATER SEWER (2015)	\$ 68,000.00	\$	\$ 28,000.00	\$ 40,000.00
1996 REVENUE BONDS	\$	\$	\$	\$
TOTAL	\$ 2,558,000.00	\$	\$ 25,400.00	\$ 2,532,600.00

Annual Meeting

Ozark Electric Cooperative
Friday, July 29, 2016
Mt. Vernon High School

Registration.....10:30 am - 1:00 pm
Lunch.....10:30 am - 12:45 pm
Entertainment.....11:15 am - 12:45 pm
Business meeting..... 1:00 pm

Register by 1 pm and get a \$10 credit on your electric bill!

- Election of Directors
- Cooperative update
- Free registration gift
- Free steak sandwich lunch
- Free musical entertainment
- Free well water testing
- Free BP and heart rate checks
- Free Veterans' information
- Drawing for attendance prizes
- And more...

DIRECTIONS: Meeting will be held at Mt. Vernon High School, 400 W. Hwy 174, in Mt. Vernon, (north side of town) about 1/2 mile east of Ozark Electric Cooperative's home office.

Please read your 4-page "Electric Sparks Annual Meeting Special Edition" in the July issue of your "Rural Missouri" for complete meeting details. Then be sure to detach your registration card (address label) from that issue and bring it to the meeting on July 29!

"High Strung" 11:15 am - 12:45 pm
(Performing in the gym)

Republicans make the rounds in Law. Co.



Far left, Dr. Shanna Chapman, owner of Chapman Medical Clinic in Pierce City, speaks with Lt. Governor Peter Kinder during his visit to Sisters Restaurant in Pierce City on Kinder's campaign trail for governor. (Photo by Steve Chapman). Left, State Senator Mike Parson takes a break from campaigning for lieutenant governor, to meet with law enforcement officials in Lawrence County the morning of July 26, at the Lawrence County Justice Center. Parson told the group that the first bill he will file at the beginning of the next session will make criminal acts targeting law enforcement officers a hate crime. Also campaigning for governor was Catherine Hanaway, who was scheduled to make an appearance at the Mountaineer in Mt. Vernon, after this paper went to press. (Photo by Ryan Squibb)

"Going solar"

continued from front

Biellier said he expects the panels to generate all of the electricity his buildings need for about nine months out of the year during daylight hours. Of course, at sunset, he will be getting his power from his power company.

"The only disadvantage we have is we can't store energy," he said. "At night time... we're pulling off (the power company's) grid."

When the panels come on line, any excess power will be sold back to the power company. Eventually, Biellier would like to have batteries installed, which provide power to his buildings after dark. "We're hoping that, somewhere down the road, batteries get better than they are," he said. "Then, we can store energy in batteries to use at night."

Though they can save money in the long term,

the equipment to generate solar power is not cheap. Biellier is investing \$110,000 in the panels and other equipment. He expects the panels to pay for themselves within four years. The panels are guaranteed to last for 25 years, which means after that, Biellier can expect the panels to generate free electricity for another two decades.

Biellier has also taken steps to protect his investment. Because the electricity the panels will generate is direct current, inverters also have to be installed to convert the electricity to alternating current. Biellier said he is using multiple inverters so the system won't go completely offline if one breaks down.

"We've put in several smaller inverters instead of one large one, so if one something fails, we don't lose the whole system," he said. An additional step Bi-

ellier has taken is to install more energy-efficient lights and motion sensors, which will turn the lights on and off in his buildings. He expects this part of his investment to pay for itself within two years.

In addition to cutting down on electric bills, there are also financial incentives to installing solar panels.

"At this time, the federal government is offering a ... 30-percent tax credit (to businesses) for going to solar," he said. "That cuts a lot of expense down. Also, the federal government is offering a grant system we may or may not get, up to \$20,000 to offset (costs)."

Despite the costs and all the time it is taking to bring his solar panels online, Biellier feels very positively about going solar.

"I feel good that we're doing it," he said. "Going green is always good."

"Voters' choice"

continued from front

Missouri Lieutenant Governor candidates are: Winton Apple, Russ Carahan, and Tommie Pieron, Sr.

Missouri Secretary of State candidates are: Bill Clinton Young, Robin Smith, MD Rabbi Alam, Missouri State Treasurer candidates are: Pat Contreras and Judy Baker.

Missouri State Attorney General candidates are: Jake Zimmerman and Teresa Henley.

United States Representative District 7 candidates are: Genevieve (Gen) Williams, Camille Lombardi-Olive and Steven Reed.

Republican Party: United States Senator candidates are: Roy Blunt, Kristi Nichols, Bernie Mowinski and Ryan D. Luethy.

Missouri Governor candidates are: Catherine Hanaway, Eric Gretners, John Brunner and Peter D. Kinder.

Missouri Lieutenant Governor candidates are: Arnie C. (AC) Dienhoff, Bev Randles and Mike

Parson. Missouri Secretary of State candidates are: Will Kraus, John (Jay) Ashcroft and Rot Chinn.

Missouri State Treasurer candidate: Eric Schmitt.

Missouri State Attorney General candidates are: Josh Hawley and Kurt Schaefer.

United States Representative District 7 candidates are: Billy Long, Christopher Batache, Matthew Evans, Lyndle Spencer, Nathan Clay Bradham, Matt Canovi, James Nelson and Mary Byrne.

State Senator District 29 candidate: David Sater (unopposed).

State Representative District 157 candidate: Mike Moon (unopposed).

State Representative District 158 candidate: Scott Fitzpatrick (unopposed).

Lawrence County Commissioner, Eastern District candidates: Joe Ruscha, Joe Boyd and Tim Selva.

Lawrence County Commissioner, Western District candidate: David Botts (unopposed).

Lawrence County Sheriff candidate: Brad Delay (unopposed).

Lawrence County Assessor candidate: Doug Boyerman (unopposed).

Lawrence County Coroner candidate: Scott Lakin (unopposed).

Lawrence County Public Administrator candidate: Pam Mieswinkel-Pohar (unopposed).

Lawrence County Precinct Committee members candidates: Nathan Fischer and Justin Guffey.

Libertarian Party: United States Senator candidates: Jonathan Dine and Herschel L. Young.

Missouri Governor candidate: Cissie W. Spraggins.

Missouri Lieutenant Governor candidate: Stephen R. Hedrick.

Missouri Secretary of State candidate: Chris Morrill.

Missouri State Treasurer candidate: Sean O'Toole.

United States Representative, District 7 candidate: Benjamin T. Bixey.

United States Senator candidate: Fred Rynnan.

"Mt. Vernon school board"

continued from front

In other news, the Missouri Learning Standards have replaced Common Core Standards. Cook is "excited about the new standards" since these may be modified to meet local needs, however, he did emphasize the need to stay close in line with state guidelines. With the new standards, second grade will be tested on language skills, fifth grade testing will cover social studies, eighth grade testing will be in high school. The board voted 5-0 to adopt the new standards.

In other action, the board voted 5-0:

- To maintain the same prices as the last seven years for all sports events.

- For Dan Harbaugh, the high school band leader, with a small group of students, to attend a student leadership workshop Aug. 18, in Broken Arrow, Okla.

- During closed session, approving substitute teachers.

- Approving a levy hearing to be held before the next board meeting at 7:30, Aug. 25.

Board members David Botts and Ron Schmiedly were absent.

"Eastern County Commissioner"

continued from front

Name: Tim Selvey
Occupation: Retired Missouri Highway State Patrol trooper, conceal and carry instructor
Residence: Between Halltown and Mt. Vernon
Education: Associate's degree, law enforcement, Missouri Southern State University. Bachelor's of Science, criminal justice, University of Central Missouri.

Why do you want to be commissioner?

"Anyone elected to the office of eastern county commissioner has a huge responsibility to serve those who gave him or her this opportunity. I certainly understand and respect this."

Why do you want to be commissioner?

"I've had the opportunity to work with state, county and municipal officials from many different departments and agencies. These past experiences give me a great perspective on how to communicate effectively on a broad range of matters and respect the opinions of those I encounter."

What makes you the best candidate for the job?

"Good past experience in public service. I've got a healthy understanding of other departments; I'm able to communicate with them, and I understand how to deal with those issues. Having dealt with lots of other broad range issues in my past experience as state trooper, I feel like I'm very qualified to handle any of the situations that come up in a commissioner's job."

Name: Joe Boyd
Occupation: Owner, Can and Able Construction

Residence: Marionville
Education: Home schooled, high-school equivalency

Why do you want to be commissioner?

"The last few years, with politics being as such in America, it's kind of gotten me stirred up to see what I could do to do my part in saving my kids' generation. There are some local people in the community around me who were expressing concern to have somebody run for eastern commissioner. So, I talked to them, and they thought I would be perfect for the job, with my background being in construction and owning my own business. With budgeting, I'm used to budgeting. I've got re-

modeling jobs budgets that you've got to stay within and stretch the dollar as much as possible. So, that being said, I decided to sign up and run for the job."

What makes you the best candidate for the job?

"I'm very experienced in bidding, sales, submitting or opening up jobs for people to bid on with the correct wordage in the proposal to make sure that all items are according to (specification), and to word it in such a way that the job cannot be done substandard. To get exactly what you want done, where you can compare apples to apples with your bids. And, I've just worked hard from a very early age. My dad was one of the original owners of Alpine Wood Products in Marionville, so I got my start in cabinetry on the weekends and summer break of school, working cabinets at a very early age. So, I'm very used to hard work, not afraid to get my hands dirty. I've grown up doing a lot of jobs that people don't want to do. The hard jobs, dirty jobs, jobs that are messed up. Going in and fixing things that aren't working right. So I think that puts me as the job being perfect for me."

PROFESSIONAL DIRECTORY

OZARK PORTABLE BUILDINGS Quality Buildings. Affordable Prices. FREE LOCAL DELIVERY. John Hensberger 417-338-9688 or 417-487-0371 6554 Lawrence Blvd., Mt. Vernon, Mo.	OLD-FASHIONED SERVICE "Keeping Mt. Vernon Well-Maintained" Donna L. Meyer D.C. FAMILY CHIROPRACTIC CARE 417-466-7166 711 N. Hickory St., Mt. Vernon, Mo. 65712	County Line Tents Custom Made Tents for Your Needs 417-466-2233 6133 Lawrence 2057 - Mt. Vernon
Carpet Cleaning 417-466-8652 SOUTHWESTERN EXTERIOR	Miss Maddy's FLORAL & GIFTS 466-0937 417 E. S. - East St. to Highway 100 (East St. to Highway 100) (Corner Hwy 100 & East St.)	Biellier Towing & Recovery 24-Hour - 466-2376 Store-It-On the Farm at Biellier's 24-Hour Access - 466-1926 Biellier Auto & Trailer Sales, LLC 1418 Vernon 144 East 45 North Clear Road 144 West - Mt. Vernon, Mo.
HEISNER Plumbing ALAN HEISNER Install - Repair - Reroute Commercial & Home Construction Remodel & Service Work - Free Estimates Senior Citizen Discounts 466-8200 or 461-9750 - Mt. Vernon	For all your heating & cooling needs... Full-Service Heating & Air Conditioning 466-2515 466-2515 466-2515 466-2515	Wedding & Banquet Lawrence County Record 312 S. Hickory St., Mt. Vernon 417-466-2185 www.lawrencecountyrecord.com
DOTY TRASH SERVICE - No discrimination in service - Residential & Commercial Locust Street - Commercial & Residential Office: 417-476-1350 Cell: 417-461-4888	Plaza Barber Shop Dianna Pierson Walk-In Welcome Wed. Fri. 9 a.m. - 4:30 p.m. Sat. 9 a.m. - 4 p.m. 466-2281 210 S. Hickory - Mt. Vernon	MID-AMERICA DENTAL & HEARING CENTER 1040 W. Harvard Drive 466-7186 558 E. Mt. Vernon Blvd. 466-4554
Simmons 417-285-6931 FURNITURE, APPLIANCES & HOME DECOR 210 S. Hickory - Mt. Vernon	Keller's Classic BARBER SHOP 106 W. Mt. Vernon Blvd. Professional Men's & Boys' Haircuts & Waxing Tues. - Fri. 8 a.m. - 5:30 p.m. Sat. 8 a.m. - 12 p.m. - 466-0229	TOM'S AUTO-CARE 310 S. Market St. Mt. Vernon, Mo. 466-4984 Open M-F 8 a.m. - 5 p.m.
Cain's FREE ESTIMATES RAPID-ROOTER 417-318-0924 - Don Cain - Mt. Vernon	Walters Chiropractic Dr. Mark Walters & Dr. Laura Walters (417) 461-1155 1014 N. Main St., Mt. Vernon, Mo. 9 a.m. - 5 p.m. Sat. 9 a.m. - 1 p.m. 1014 N. Main St. & E. 15 p.m. - 6 p.m. Sat. 9 a.m. - 1 p.m.	KNAUST AUCTION SERVICE Monett, Mo. Kenneth Knaust (417) 235-4873 Cell (417) 235-6141 Office
adams ROOFING We are local roofers Matt 417-693-0553	L&M TIRE & AUTO OLIO CHANGE & ALIGNMENTS Mount Vernon, Mo. (Outside Westtown Center) 466-3383	

U.S. Environmental Protection Agency Region 7 begins the Fifth-Year Review for the Solid State Circuits, Inc., Superfund Site Republic, Greene County, Missouri

The U.S. Environmental Protection Agency has started the fifth-year review for the Solid State Circuits, Inc., Superfund Site. The review is required by the Superfund law to make sure completed cleanups continue to protect human health and the environment. This five-year review should be completed by September 2017.

The EPA encourages community members to ask questions and report any concerns about this site. A final report will be prepared at the end of the review.

The EPA has assessed the ability of the local public to access the five-year review through an internet-based repository and has determined that the local community has this ability. As a result, the fifth-year review for this site will be available through an internet site once completed.

Questions or requests for site information and/or the five-year-review process can be submitted to:

Pamela Houston
U.S. EPA Community Engagement Specialist
Toll free: 800-223-0425
Email: houston.pamela@epa.gov

Additional site information and previous five-year reviews are available at the following website:

<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?siteid=0701392>

Appendix G
Information Sheet



Fifth Five-Year Review Completion

Solid State Circuits Superfund Site
Intersection of Elm and Main Streets, Downtown Republic

September 2017

Introduction

The Missouri Department of Natural Resources, on behalf of the U.S. Environmental Protection Agency (EPA), conducts regular Five-Year Reviews (FYR) on Superfund sites where cleanups are ongoing; yet have not been completed. These reviews are required by the Superfund law [42 U.S.C. Section 9621 (c)]. The department has completed its fifth FYR of the Solid State Circuits Superfund Site in Republic.

Site Background

The Solid State Circuits Superfund site covers one-half acre in downtown Republic. Trichloroethylene (TCE) was detected in the city of Republic's *Municipal Well No. 1* (CW-1) in the 1980s. The CW-1 well provided a large portion of the drinking water for Republic. An investigation by the department determined that Solid State Circuits, a former printed circuit board manufacturer, was the source of the TCE contamination. TCE contamination was also found in groundwater; Areas 1, 2 and 3 soils; and in the remaining basement structure of a former building on the site.

Site removal actions completed between 1983 and 1985, after the facility building was destroyed by a fire, included:

- Removal of 2,000 cubic yards of contaminated material
- Plugging and sealing of the basement's well
- Removal of Republic's CW-1 well from service
- Filling in the basement with rock topped with two feet of soil that was graded and seeded
- Installing of a fence with a locking gate for added security

Site remedial actions completed between 1989 and 1994 consisted of:

- Installation of municipal wells CW-4 and CW-5
- Installation of additional on-site and off-site monitoring wells to monitor the cleanup of the contaminated groundwater
- Installation of additional groundwater extraction wells
- Creation of an on-site treatment facility to treat the extracted contaminated groundwater

Five-Year Review

A number of site-related remedial actions occurred both on- and off-site during the fifth FYR period. Along with conducting a site visit and interviews, the department reviewed the recent site data and information obtained during this FYR review period to determine if the remedy continues to be protective of human health and the environment. The department encourages members of the community to review the completed fifth FYR report that will be available at the site information repository located at the Springfield/Greene County Library in Republic. The community can submit questions, comments and concerns related to the report or any ongoing site-related remedial actions to the department at the address listed below in the box.

The site administrative record is available during normal library hours:

Republic Branch Library—Springfield—Greene County Library District
921 N. Lindsey
Republic, MO 65738
417-732-7284

<https://cumulis.epa.gov/supercpad/CurSites/csitinfo.cfm?id=0701392&msspp=med>

For more information, please contact Candice McGhee, Project Manager, Missouri Department of Natural Resources, Hazardous Waste Program, P.O. Box 176, Jefferson City, MO 65102; or call 573-751-1738; or email Candice.mcgee@dnr.mo.gov.